



# STUDENT RESEARCH & **CREATIVITY** **SYMPOSIUM**

**APRIL 1-2, 2026**



# Letter from the President

Brad D. Smith

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Dear Students, Faculty and Guests,

Welcome to the 5th Annual Student Creativity and Research Symposium at Marshall University.

It is a joy to gather together for this celebration of curiosity, discovery, and the power of ideas. As a proud Carnegie R2 research university, Marshall is committed not only to teaching knowledge, but to creating it. Today's symposium highlights that mission through the work of our students.

I want to begin by offering my sincere appreciation to Dr. Philippe Georgel and the Office of Academic Affairs, along with the many faculty mentors and staff who make this event possible. Their commitment to nurturing student inquiry and discovery reflects the very best of Marshall's academic community.

I also wish to extend my congratulations to our student researchers and creators. The work you are presenting today represents hours of curiosity, discipline, collaboration, and perseverance. It also reflects the courage to ask questions that do not yet have answers.

One of the great privileges of a university is the opportunity to explore, testing ideas, challenging assumptions, and following your curiosity wherever it leads. In many ways, research is simply curiosity put into action.

Like all meaningful discovery, it does not come in a straight line. There will be moments when experiments fail, hypotheses collapse, or results surprise you. That is not the end of the process. It is the process. Every great scientist, scholar, and innovator has learned as much from what didn't work as from what did.

I encourage you to lean into that spirit of exploration. Ask bold questions. Test new ideas. Collaborate across disciplines, and above all, stay curious.

What you are doing here today represents the very heart of Marshall University's mission—accelerating individual success, innovative ideas, and economic impact in the communities and region we serve.

Thank you for sharing your creativity and research with us. I look forward to seeing the remarkable ideas and discoveries that will emerge from this symposium.

Sincerely,

**Brad D. Smith**  
**President**

# PROVOST

## Dr. Robert Bookwalter



Greetings, and welcome to the Fourth Annual Student Creativity & Research Symposium at Marshall University. It is a pleasure to join you in this annual celebration of scholarly and creative work by Marshall students across disciplines from every college. This symposium represents a meaningful opportunity to recognize the sustained effort, intellectual rigor, and creativity our students bring to their work.

Marshall University's designation as a Carnegie R2 research institution reflects our commitment to discovery, innovation, and the integration of research and creative activity into the undergraduate and graduate experience. Our students are central to that mission. The projects showcased this week demonstrate not only academic excellence, but also the curiosity and problem-solving mindset essential to addressing complex challenges within our disciplines and beyond the university.

Participation in this symposium allows students to work closely with faculty mentors, to share their findings and creative work with a broad audience, and to engage in substantive dialogue with peers, faculty, and community members. These experiences strengthen students' research and communication skills and prepare them for professional success and lifelong learning.

I am proud of the students whose work we see in this year's symposium. I am grateful to the faculty and staff whose commitment made this event possible and who continue to support student scholarship throughout the academic year. Your mentorship and leadership are critical to sustaining a culture of inquiry and creativity at Marshall University.

I invite you to fully engage with this signature academic event as we celebrate the accomplishments of our students and the contributions they are poised to make to their professions, our communities, and the broader world.

Go Herd!

Sincerely,

**Dr. R.B. Bookwalter**

Interim Provost & Senior Vice President of Academic Affairs

# Welcome

## Philippe Georgel



It is with great enthusiasm that we welcome you to the 2026 Marshall University Student Research and Creativity Symposium. Now entering its sixth year, the symposium has grown into a signature academic event that reflects the expanding scope, depth, and excellence of student scholarship across our campus.

Over the next two days, we invite you to explore and celebrate the outstanding work of our undergraduate and graduate students representing every college and discipline at Marshall. From scientific discovery to artistic innovation, from community health initiatives to entrepreneurial ventures, participants will share their achievements through oral presentations, poster sessions, performances, debates, demonstrations, and creative works. This diverse and vibrant collection of presentations exemplifies Marshall University's commitment to fostering curiosity, interdisciplinary collaboration, and intellectual leadership.

This year's symposium features more than 150 presentations, along with a presentation by our keynote speaker, Dr. Xavier Minguez-López from the University of Valencia and a student-led panel that highlight emerging trends in research and creativity and education. We are particularly pleased to continue offering hybrid participation

options, ensuring that students and collaborators beyond our campus can engage meaningfully in the experience.

I want to extend my deepest gratitude to the Symposium Advisory Board, our sponsors, faculty mentors, staff, and the broader community whose dedication and support make this event possible. Your investment in our students nurtures the next generation of innovators, scholars, artists, and creative thinkers.

As you participate in this year's events, we encourage you to engage fully—ask questions, make connections, share perspectives, and be inspired. The symposium is not only a celebration of achievement but a catalyst for new ideas, new collaborations, and new opportunities.

Thank you for joining us. Let the 2026 Symposium begin!

Warm regards,

**Philippe T. Georgel, Ph.D.**

Senior Director of the Office of Student Research

# STUDENT RESEARCH & CREATIVITY SYMPOSIUM

## OVERVIEW

The Student Research and Creativity Symposium at Marshall University is intended to celebrate, promote and recognize undergraduate and graduate research and creativity across all colleges and units.

The two-day event includes a Keynote presentation by Dr. Xavier Minguez-López from the University of Valencia on Wednesday April 1st at 2:15pm in the Brad D. Smith Center for Business and Innovation (Room SBUS 116: Encova Auditorium), followed by a full day of oral and poster presentations, as well as artistic performances by our undergraduate and graduate students on Thursday, April 2nd. As our first day includes a presentation by our prestigious guest speaker, the second day, Thursday April 2nd, will include a panel lunch involving local students focusing on “Story to Self: Students on Creativity, Identity, and Learning”, organized by Makaylah Wheeler (Department of Communication).

## GOALS

*The symposium will:*

- Showcase the best students work from across Marshall University to our campus and local audiences.
- Contribute to the continuing growth of Marshall as a research university.
- Demonstrate how student accomplishments can contribute to the economy and quality of life of the surrounding intellectual and business community.

## IMPACT

Students who take part in the experience will build their presentation experience and will connect with a broader audience outside of Marshall University. The hope is for younger students to draw inspiration and to aim higher in their endeavors. The event also impacts Marshall University by showcasing the breadth of student achievement to the surrounding community.

## PARTICIPATING UNITS

- College of Arts and Media
- Brad Smith School of Business
- College of Education and Professional Development
- College of Engineering and Computer Sciences
- College of Health Professions
- College of Liberal Arts
- College of Science
- Joan C. Edwards School of Medicine
- School of Pharmacy
- Chancellor’s Scholars Program
- Honors College



# STUDENT RESEARCH & CREATIVITY SYMPOSIUM



## Guest Speaker

### **Dr. Xavier Mínguez López**

Associate Professor, Language and Literature at University of Valencia

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Dr. Mínguez-López is a tenured Associate Professor at the University of Valencia, where my teaching and research focus on language and literature education, with a special interest in children's and young adult literature, intercultural education, literary competence, and creativity in learning processes. Throughout my career, he has been fascinated by how imagination, storytelling, and critical thinking shape the way we learn. After completing his PhD in Education — awarded the Extraordinary Doctoral Prize — he has combined teaching, research, and international collaboration to explore how literature, visual narratives, and creative practices can open new spaces for learning.

His publications address multiculturalism, diversity and gender representation in picturebooks, audiovisual narratives, and creative approaches to literary education. A central strand of his work investigates how creativity — through storytelling, metaphor generation, interdisciplinary arts, and innovative reading practices — can

enrich literary competence and support teacher education. Beyond research, he regularly participates in keynote lectures, editorial projects, conference organization, and international academic networks, always trying to connect theory with meaningful educational practice through textbooks, teacher-training programs, and cooperation projects in vulnerable contexts. Research stays at the International Youth Library (Munich, Germany, 2018) and the Harvard Graduate School of Education (Cambridge, USA, 2025–2026) have strengthened my global and collaborative perspective.

His current research explores how multicultural books influence — or sometimes do not influence — the development of students' intercultural competence.

# STUDENT RESEARCH & CREATIVITY SYMPOSIUM

**Wednesday, April 1, 2026**

**2:15pm – 2:30pm** ..... **Welcome**

Brad D. Smith Center for Business & Innovation, Encova Auditorium (SBUS 116) *Opening*

*Statement by **Dr. Philippe Georgel**, Sr. Director of the Office of Student Research*

*Welcome from **Marshall University Provost Dr. Robert Bookwalter***

**2:30pm – 3:30pm** ..... **Keynote Speaker Presentation**

Brad D. Smith Center for Business & Innovation, Encova Auditorium (SBUS 116)

*“Playing for Reading: Developing Creativity through Literary Education.”*

*Dr. Xavier Minguez López (University of Valencia): Tenured Associate Professor whose work focuses on children’s and young adult literature, intercultural education, and creativity in learning. Recipient of the Extraordinary Doctoral Prize for his Ph.D. work, he studies how storytelling, visual narratives, and multicultural books support literary and intercultural competence. His research includes international research appointments at the International Youth Library in Munich and the Harvard Graduate School of Education, and he contributes widely to teacher education, creative literacy practices, and global academic collaborations.*

**3:30pm – 4:00pm** ..... **Questions and Forum Discussion**

Brad D. Smith Center for Business & Innovation, Encova Auditorium (SBUS 116)

**4:00pm – 5:30pm** ..... **Reception and Social Gathering**

Brad D. Smith Center for Business & Innovation, Lobby and SBUS 113

# STUDENT RESEARCH & CREATIVITY SYMPOSIUM

## Thursday, April 2, 2026

**8:30am – 8:45am** ..... **Welcome**

Memorial Student Center, Don Morris Room (2nd Floor)

*Welcome form **Marshall University President Brad D. Smith***

**12:15pm – 1:30pm** ..... **Student-organized Panel Lunch**

Memorial Student Center, Don Morris Room (2nd Floor)

*Lunch will be served during the panel discussion*

**4:00pm – 4:45pm** ..... **Awards Ceremony & Closing**

Memorial Student Center, Don Morris Room (2nd Floor)

*Tea and coffee will be served during the ceremony*

## Undergraduate and Graduate Poster Sessions

**8:45am – 3:30pm** ..... **Poster Sessions for Undergraduate and Graduate Students**

Memorial Student Center, Lobby (1st and 2nd Floor)

## Undergraduate Students Oral Presentations and Performances

**8:45am – 9:30am** ..... **Oral Presentation Sessions 1-A, 1-B, 1-D**

See program for locations within Memorial Student Center, Session 1-D in Drinko Library Atrium

**9:45am – 10:30am**..... **Oral Presentation Sessions 2-A, 2-B**

See program for locations within Memorial Student Center

## Graduate Students Oral Presentations and Performances

**8:45am – 9:30am** ..... **Oral Presentation Sessions 1-C, 1-D**

See program for locations within Memorial Student Center, Session 1-D in Drinko Library Atrium

**9:45am – 10:30am**..... **Oral Presentation Session 2-C**

See program for locations within Memorial Student Center

**10:45am – 11:30am**..... **Oral Presentation Sessions 3-A, 3-B, 3-C**

See program for locations within Memorial Student Center

**11:30am – 12:15am**..... **Oral Presentation Sessions 4-A, 4-B, 4-C**

See program for locations within Memorial Student Center

**1:45am – 2:30am** ..... **Oral Presentation Sessions 5-A, 5-B**

See program for locations within Memorial Student Center

**2:45am – 3:30am** ..... **Oral Presentation Sessions 5-A, 5-B**

See program for locations within Memorial Student Center

# Oral Presentation and Performance Sessions

## **Session 1-A: Memorial Student Center, Shawkey Room (2nd Floor) .....8:45am - 9:30am**

USB Rubber Ducky Attacks: Cybersecurity Awareness Demonstration

College of Engineering & Computer Sciences ..... Undergraduate UGO-03

Presenter: Michael Davis, davis1468@marshall.edu .....Oral Presentation

Adolescent Binge Drinking Engages Microglial Phagocytic Pathways to Reshape Astrocyte-Synapse Morphology

College of Science.....Undergraduate UGO-10

Presenter: Lucas Stanley, stanley254@marshall.edu .....Oral Presentation

## **Session 1-B: Memorial Student Center, 2W16B (2nd Floor) .....8:45am - 9:30am**

Perceived Supervisor Support and Fun at Work: Effects on Performance and Retention

College of Liberal Arts..... Undergraduate UGO-06

Presenter: Stella Harless, harless134@marshall.edu .....Oral Presentation

Organizational Factors That Influence Quality of Care, Burnout, and Secondary Traumatic Stress

College of Liberal Arts..... Undergraduate UGO-07

Presenter: Jamie Menshouse, menshousej@marshall.edu .....Oral Presentation

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

Improving fluency and comprehension skills to second grade students with integration of technology

College of Education & Professional Development..... Graduate GO-04

Presenter: Annjela Twardy, Twardy2@Marshall.edu.....Oral Presentation

Adult Literacy Education

College of Education & Professional Development..... Graduate GO-05

Presenter: Kindra Lacy, Kindra.lacy@k12.wv.us.....Oral Presentation

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

A research study on Heitor Villa-Lobos' Preludes, Etudes, and Suite populaire bresillenne

College of Arts & Media..... Undergraduate UGO-01

Presenter: Matthew Brumfield, brumfield160@marshall.edu .....Oral Presentation

Riders of Revelation: The Four Horsemen in Art and Media

College of Arts & Media..... Undergraduate UGO-02

Presenter: Abby Thompson, thompson853@marshall.edu .....Oral Presentation

Piano Music from Around the World

College of Arts & Media..... Graduate GO-01

Presenter: James Steven F. Sibbaluca, sibbaluca@marshall.edu .....Oral Presentation

**Session 2-A: Memorial Student Center, Shawkey Room (2nd Floor) ..... 9:45am - 10:30am**

Evaluating Potential for Workplace Injury Among Healthcare Workers Through Functional and Isokinetic Performance Assessment

College of Health Professions ..... Undergraduate UGO-04  
Presenter: Mia McBride, mcbride42@marshall.edu ..... Oral Presentation

Effects of Pectoralis Minor Length on Scapular Kinematics

College of Health Professions ..... Undergraduate UGO-05  
Presenter: Tristan Camarillo, camarillo1@marshall.edu ..... Oral Presentation

**Session 2-B: Memorial Student Center, 2W16B (2nd Floor) ..... 9:45am - 10:30am**

The City of Facebook? Does social media impact the decision-making of municipal government officials: a West Virginia Case Study.

College of Liberal Arts ..... Undergraduate UGO-08  
Presenter: Michael Borsuk, borsuk@marshall.edu ..... Oral Presentation

Omotenashi and Japanese Convenience Store Culture into North America: Seven & i Holding's Advertising Strategy

College of Liberal Arts ..... Undergraduate UGO-09  
Presenter: Haley Elkins, elkins163@marshall.edu ..... Oral Presentation

**Session 2-C: Memorial Student Center, John Spotts Room (2nd Floor) ..... 9:45am - 10:30am**

Story Boards For Young Children

College of Education & Professional Development ..... Graduate GO-06  
Presenter: Riley Bowyer, bowyer44@marshall.edu ..... Oral Presentation

Assessing the Role of Text Complexity in Social Studies Reading Comprehension in Ohio

College of Education & Professional Development ..... Graduate GO-07  
Presenter: Elizabeth Crawford, barnhart14@marshall.edu ..... Oral Presentation

**Session 3-A: Memorial Student Center, Shawkey Room (2nd Floor) ..... 10:45am - 11:30am**

Boeing's Ongoing Quality Control Challenges

College of Business ..... Graduate GO-02  
Presenter: Julie Shuck, shuck10@marshall.edu ..... Oral Presentation

**Session 3-B: Memorial Student Center, 2W16B (2nd Floor) ..... 10:45am - 11:30am**

Appalachian Students' Persistence Following Academic Probation: A Phenomenological Inquiry

College of Liberal Arts ..... Graduate GO-08  
Presenter: Sam Holiskey, holiskey@marshall.edu ..... Oral Presentation

Vibia Perpetua - The Exception or the Rule

College of Liberal Arts ..... Graduate GO-09  
Presenter: Mike Edwards, edwards337@marshall.edu ..... Oral Presentation

**Session 3-C: Memorial Student Center, John Spotts Room (2nd Floor) ..... 10:45am - 11:30am**

Impact of Career Technical Education Instructors' Professional Experiences on Student Engagement

College of Education & Professional Development ..... Graduate GO-20  
Presenter: Summer Grose, grose52@marshall.edu ..... Virtual Oral Presentation

Developing a Workplace and Life Skills Curriculum for 12th Grade Students

College of Education & Professional Development ..... Graduate GO-21  
Presenter: April (Heike) Estep, heike1@marshall.edu ..... Oral Presentation

**Session 4-A: Memorial Student Center, Shawkey Room (2nd Floor)..... 11:30am - 12:15pm**

IRS vs. The Coca-Cola Company on transfer pricing business plan.  
College of Business ..... Graduate GO-18  
Presenter: Bryce Charles Tawes, tawes@marshall.edu ..... Virtual Oral Presentation

Palantir Technologies LLC., and Violations of the Privacy Act of 1974 Analysis Memo  
College of Business ..... Graduate GO-19  
Presenter: Derek Lister, lister5@marshall.edu ..... Virtual Oral Presentation

**Session 4-B: Memorial Student Center, 2W16B (2nd Floor) ..... 11:30am - 12:15pm**

Humanity, Political Paranoia, and the Uncanny in No, I'm Not a Human  
College of Liberal Arts ..... Graduate GO-10  
Presenter: Jacob Wood, wood233@marshall.edu ..... Oral Presentation

**Session 4-C: Memorial Student Center, John Spotts Room (2nd Floor) ..... 11:30am - 12:15pm**

Student Retention in Music Programs: Demographics and Enrollment in an Intervention Rich District  
College of Education & Professional Development ..... Graduate GO-22  
Presenter: Jessica Wiese, wiese3@marshall.edu ..... Virtual Oral Presentation

Embedding Structured Literacy Routines to Improve Algebra I Word Problem Comprehension  
College of Education & Professional Development ..... Graduate GO-23  
Presenter: Christy Delp, martin993@marshall.edu ..... Virtual Oral Presentation

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

Formulation And In Vitro Assessment Of 5-Fluorouracil Loaded Plga Nanoparticles For Hepatic Resistin  
Modulation In Nafld  
School of Pharmacy ..... Graduate GO-14  
Presenter: Kavya Yandapalli, yandapalli@marshall.edu ..... Oral Presentation

Formulation and Physicochemical Characterization of a Quercus infectoria–Chitosan Topical Gel for Wound  
Healing Applications  
School of Pharmacy ..... Graduate GO-15  
Presenter: Rani Naga Rakshitha Tillapudi, tillapudi@marshall.edu ..... Oral Presentation

**Session 5-B: Memorial Student Center, 2W16B (2nd Floor) ..... 1:45pm - 2:30pm**

War-Induced Trauma: Ancient Perspectives and Modern Experiences  
College of Liberal Arts ..... Graduate GO-11  
Presenter: Abigail Parks, parks64@marshall.edu ..... Oral Presentation

From 'Addicts' to 'People With Substance Use Disorders?' A Longitudinal Analysis of Newspaper Language in West  
Virginia  
College of Liberal Arts ..... Graduate GO-12  
Presenter: Candace Smith, smith2499@marshall.edu ..... Oral Presentation

**Session 6-A: Memorial Student Center, Shawkey Room (2nd Floor)..... 2:45pm - 3:30pm**

Preparation and Characterization of 5-Fluorouracil (5FU) Loaded Silver Nanoparticles for Delayed Wound Healing  
School of Pharmacy..... Graduate GO-16  
Presenter: Kamal Nath Kasi, kasi@marshall.edu.....Oral Presentation

Determining Methamphetamine Doses that Produce Comparable and Stable Locomotor Activity in Male and  
Female Rats  
School of Pharmacy..... Graduate GO-17  
Presenter: Isaac Dickess, dickess16@marshall.edu.....Oral Presentation

**Session 6-B: Memorial Student Center, 2W16B (2nd Floor) ..... 2:45pm - 3:30pm**

Adolescent Alcohol Exposure Disrupts Astrocyte-Synaptic Structural And Functional Coupling In The Male Dorsal  
Hippocampus  
School of Medicine ..... Graduate GO-13  
Presenter: Olivia Coulter, coulter31@marshall.edu.....Oral Presentation

Tobacco Screening in Marshall University Department of Family Medicine - A Quality Improvement Project  
School of Medicine ..... Graduate GO-24  
Presenter: Krithika Shrinivas, shrinivas@marshall.edu ..... Virtual Oral Presentation

# Undergraduate Student Posters

Fabric of Hope College of Arts & Media .....	Undergraduate UGP-01
Presenter: Kim Arden, arden11@marshall.edu.....	Poster
Rebranding Lilly's Place: Strengthening Community Awareness and Support Through Design Thinking College of Arts & Media .....	Undergraduate UGP-02
Presenter: Ashley Ferguson, ferguson361@marshall.edu .....	Poster
Trauma Responsiveness to Domestic Violence in Huntington, West Virginia College of Arts & Media .....	Undergraduate UGP-03
Presenter: Allyson Goodman, goodman4@marshall.edu .....	Poster
Assessing the Impact of Spaceflight and Shielding Materials on Agricultural Soil Microorganisms College of Engineering & Computer Sciences .....	Undergraduate UGP-04
Presenter: Macy Smith, smith3466@marshall.edu.....	Poster
Study to regulate the chemokine binding protein to restrain inflammation College of Engineering & Computer Sciences .....	Undergraduate UGP-05
Presenter: Raghav Puri, puri1@marshall.edu .....	Poster
AI-based Super-Resolution of Single Tooth RGB Images College of Engineering & Computer Sciences .....	Undergraduate UGP-06
Presenter: Aiden Taylor, taylor1144@marshall.edu .....	Poster
RGB D Guided Insufficient Ballast Detection for Improved Fault Classification in Rail Environments College of Engineering & Computer Sciences .....	Undergraduate UGP-07
Presenter: Dylan Lester, Lester299@marshall.edu .....	Poster
The Thermal Theatrics: Hydraulic Vulcanization Press College of Engineering & Computer Sciences .....	Undergraduate UGP-08
Presenter: John Killian, killian5@marshall.edu.....	Poster
Methane on the map College of Engineering & Computer Sciences .....	Undergraduate UGP-09
Presenter: Marshall Villers, villers9@marshall.edu.....	Poster
Nonlinear Approach for Defect Detection of Structures Using Impact Echo Detection and Impact Hammer College of Engineering & Computer Sciences .....	Undergraduate UGP-10
Presenter: Tanner Samples, Luke Lanham, Killian Blake, And Camron McCormick, samples61@marshall.edu	Poster
Comparison of Deep Learning Models for Defect Detection on Railroads College of Engineering & Computer Sciences .....	Undergraduate UGP-11
Presenter: Aayush Damai, damai2@marshall.edu .....	Poster
Design of an Automated Industrial Waste Management System for Nucor College of Engineering & Computer Sciences .....	Undergraduate UGP-12
Presenter: Josie Farris, Luke Tilka, Mason Price, And Jordan Brown, farris33@marshall.edu.....	Poster
Graphic User Interface For Drone Swarm Control College of Engineering & Computer Sciences .....	Undergraduate UGP-13
Presenter: Samuel Sutphin, sutphin54@marshall.edu .....	Poster

Project H.E.R.D. (Hostile-UAS Emulation & Resilience Development) College of Engineering & Computer Sciences .....	Undergraduate UGP-14
Presenter: Thomas Ruffell, Michele Fortner, Alex Costa, And Yousef Sardahi, fortner40@marshall.edu.....	Poster
Rapid Characterization of 3D-Printed Bone Scaffolds Using Neural Network-Based Image Analysis toward Enhanced Stem Cell Integration College of Engineering & Computer Sciences .....	Undergraduate UGP-15
Presenter: Indigo Graves, graves70@marshall.edu.....	Poster
Men's Health in Appalachia: Chronic Disease and Behavioral Health Outcomes for Men Living in West Virginia College of Health Professions .....	Undergraduate UGP-16
Presenter: Randy Gibson, gibson400@marshall.edu.....	Poster
Relationship Between Pectoralis Minor Stiffness and Anterior Shoulder and Head Posture College of Health Professions .....	Undergraduate UGP-17
Presenter: Peyton Fannin, fannin80@marshall.edu .....	Poster
The Effects of Walking on Medial Collateral Ligament Stiffness College of Health Professions .....	Undergraduate UGP-18
Presenter: William Elk, elk4@marshall.edu.....	Poster
The Assessment of Anterior Cruciate Ligament Stiffness Using Ultrasound Sheer Wave Elastography College of Health Professions .....	Undergraduate UGP-19
Presenter: Jamie Naylor, naylor32@marshall.edu .....	Poster
MCL Stiffness and Strain College of Health Professions .....	Undergraduate UGP-20
Presenter: Ellie Andrick, andrick4@marshall.edu.....	Poster
Effects of Pectoralis Minor Length on Scapular Kinematics College of Health Professions .....	Undergraduate UGP-21
Presenter: Tristan Camarillo, camarillo1@marshall.edu.....	Poster
The Relationship Between Pectoralis Minor Stiffness and Glenohumeral External Rotation College of Health Professions .....	Undergraduate UGP-22
Presenter: Ian Sullivan, sullivan161@marshall.edu .....	Poster
A Literature Review of the Beneficence of Vocal Health Knowledge for Voice Users College of Health Professions .....	Undergraduate UGP-23
Presenter: Rachelle Snyder, snyder250@marshall.edu.....	Poster
Creatine Supplementations Effect on Maximal Grip Performance in Novice Rock Climbers College of Health Professions .....	Undergraduate UGP-24
Presenter: Katherine Dyer, dyerka@marshall.edu.....	Poster
How Weight Distribution Differs Between High- and Low-Handicaps Across A Range Of Clubs College of Health Professions .....	Undergraduate UGP-25
Presenter: Tyler Young, young483@marshall.edu .....	Poster
The City of Facebook? Does social media impact the decision-making of municipal government officials: a West Virginia Case Study. College of Liberal Arts.....	Undergraduate UGP-26
Presenter: Michael Borsuk, borsuk@marshall.edu.....	Poster

Coalitional Strength as a Predictor of Anger Proneness College of Liberal Arts.....	Undergraduate UGP-27
Presenter: Christopher Hall, hall958@marshall.edu .....	Poster
Wealth and Resources as Predictors to Anger Proneness College of Liberal Arts.....	Undergraduate UGP-28
Presenter: Sawyer Adkins, adkins1712@marshall.edu .....	Poster
Buried Histories: An Analysis of Death Records from Huntington’s Historic Black Cemetery College of Liberal Arts.....	Undergraduate UGP-29
Presenter: Abigail Carney, carney49@marshall.edu .....	Poster
Social Standing as a Predictor of Anger Proneness College of Liberal Arts.....	Undergraduate UGP-30
Presenter: Jaron Skanes, skanes@marshall.edu .....	Poster
Benchmarks for the Effect of Religious Priming on Prosocial Behavior College of Liberal Arts.....	Undergraduate UGP-31
Presenter: Benjamin Whitmore, whitmore27@marshall.edu.....	Poster
Life, Love, and Trauma: Examining the association among ACEs, emotional intelligence, and relationship satisfaction. College of Liberal Arts.....	Undergraduate UGP-32
Presenter: Olivia Kingrey, kingrey7@marshall.edu .....	Poster
Impacts of Parenting Styles on Social Anxiety in Appalachia College of Liberal Arts.....	Undergraduate UGP-33
Presenter: Abigail Wilson, wilson885@marshall.edu.....	Poster
Growth Mindsets in Management: A Review on Current Literature College of Liberal Arts.....	Undergraduate UGP-34
Presenter: Brandt Thompson, thompson896@marshall.edu.....	Poster
Looking at Correlations Between Emotional Intelligence, Relationship Quality, and Life Satisfaction Among Appalachian College Students. College of Liberal Arts.....	Undergraduate UGP-35
Presenter: Ethan Smith, smith3381@marshall.edu .....	Poster
Exploring College Students’ Biases in Relation to Personality College of Liberal Arts.....	Undergraduate UGP-36
Presenter: Aly Yankey, yankey1@marshall.edu.....	Poster
Tenant Protections for Domestic Violence Survivors in West Virginia College of Liberal Arts.....	Undergraduate UGP-37
Presenter: E Provost, provost1@marshall.edu .....	Poster
Attitudes Toward DEI and Their Association with Social Bias Among College Students College of Liberal Arts.....	Undergraduate UGP-38
Presenter: Tucker Watson, watson264@marshall.edu.....	Poster
War on the Move: Rural Revitalization One Step at a Time College of Liberal Arts.....	Undergraduate UGP-39
Presenter: Kurt Schade, schade2@marshall.edu .....	Poster

The Role of Metabolic Dysfunction on Traumatic Brain Injury (TBI) College of Science.....	Undergraduate UGP-40
Presenter: Ava Garmestani, garmestani1@marshall.edu.....	Poster
Gut Microbial Metabolites of Dietary Tryptophan Stimulate Goblet Cell Differentiation in Human Colonic Organoids College of Science.....	Undergraduate UGP-41
Presenter: Morrison Chicko, chicko1@marshall.edu.....	Poster
Regional and Obesity-Associated Variations in Intestinal Insulin Receptor Expression College of Science.....	Undergraduate UGP-42
Presenter: William Dillow, dillow32@marshall.edu.....	Poster
Predictors of Prolonged Emergency Department Length of Stay Among Adult Psychiatric Patients in Rural Appalachia College of Science.....	Undergraduate UGP-43
Presenter: Laney Fletcher, fletcher123@marshall.edu.....	Poster
Neuroinflammatory and Oxidative Stress Responses to High-Fat diets, Ethanol Consumption, and Phytol College of Science.....	Undergraduate UGP-44
Presenter: Kaden Shaffer, shaffer152@marshall.edu.....	Poster
Self-Organized Metasurface Enabling Negative Photoconductance and Memristive Behavior via van der Waals Interaction College of Science.....	Undergraduate UGP-45
Presenter: Tyler Parsons, parsons416@marshall.edu.....	Poster
From Diagnostics to Dangerous: The Danger of Arbitrary CAN Control in Remote Vehicle Telematics Systems College of Science.....	Undergraduate UGP-46
Presenter: Garrett Lilly, lilly314@marshall.edu.....	Poster
Identifying neurons and neural activation following odor stimulation of <i>Rhagoletis pomonella</i> fruit flies College of Science.....	Undergraduate UGP-47
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# Abstract Book

## UGO-01

**Title:** A research study on Heitor Villa-Lobos' Preludes, Etudes, and Suite populaire bresillenne

**Authors/Presenters:** Matthew Brumfield brumfield160@marshall.edu

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**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Not Applicable

### Abstract

The purpose of this project is to highlight the importance and significance of the solo guitar works by Brazilian composer Heitor Villa-Lobos in the standard classical guitar repertoire, and how he blended Western Classical music traditions with Brazilian elements. My research will also address the potential influences that political and economic status might have had on his music. Villa-Lobos was born in Rio De Janeiro, Brazil on March 5th, 1887. Throughout his long career as a composer, he was known for weaving together elements of traditional Brazilian music and the classical Western music traditions that had been part of his music education. Although his compositions for orchestra, bowed string instruments and voice are all important to his overall catalogue, Villa-Lobos made a substantial contribution to the guitar repertoire with his guitar compositions (5 Préludes, 12 Etudes, Suite populaire brésilienne, Choros No. 1, Sexteto Místico, and Concerto for Guitar and Orchestra).

**Keywords:** Brazil, Europe, Guitar, Influence, Chôro

## UGO-02

**Title:** Riders of Revelation: The Four Horsemen in Art and Media

**Authors/Presenters:** Abby Thompson

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**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Not Applicable

### Abstract

This paper examines the Four Horsemen of the Apocalypse—Conquest, War, Famine, and Death—as enduring symbolic figures whose visual representations have evolved alongside shifting social, political, and cultural anxieties. Originating in the Book of Revelation, the Horsemen functioned initially as prophetic warnings of divine judgment. Over time, artists and cultural producers have reinterpreted these figures to reflect the lived realities of their historical moments, transforming apocalypse from a distant event into a recurring condition.

Beginning with biblical text and early Christian interpretation, this study traces the development of the Four Horsemen through medieval religious imagery, Renaissance print culture, and modern visual media. Particular attention is given to how periods of conflict, inequality, and instability shaped the iconography of the Horsemen, embedding contemporary fears within inherited symbolic frameworks. In modern and popular media, these figures increasingly operate as metaphors for systemic power, violence, and normalization of crisis rather than strictly theological prophecy.

The paper concludes with a case study of Visions of the End, a contemporary fashion collection that reinterprets the Four Horsemen through wearable forms. By translating apocalyptic symbolism into contemporary dress, the project positions fashion as a medium capable of critical discourse, bridging historical religious imagery with present-day political and social realities. Through this progression, the study demonstrates that the Four Horsemen persist not as relics of belief, but as adaptable symbols continually reshaped by the conditions of their time.

**Keywords:** Revelations, Capstone, Fashion, Art and Media, Four Horsemen

## UGO-03

**Title:** USB Rubber Ducky Attacks: Cybersecurity Awareness Demonstration

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**Sponsoring Institutions:** College of Engineering & Computer Sciences, Honors College

**Research Sponsors:** Not Applicable

### Abstract

The presentation focuses on the USB Rubber Ducky, a device that resembles a standard USB flash drive but functions as a Human Interface Device (HID) capable of emulating a keyboard. By issuing automated keystrokes at high speed, such devices can execute commands on a target system without user awareness, illustrating the security risks posed by rogue peripherals. I will study the underlying mechanisms of USB-based keystroke-injection attacks and develop a set of demonstration payloads of increasing severity to highlight the potential impact of hot-plug attacks.

The payloads will be organized into three severity levels. Low-severity payloads will demonstrate system compromise with minimal operational impact (e.g., visual changes or minor performance degradation). Medium-severity payloads will alter system behavior or access critical components (e.g., file manipulation or configuration changes). High-severity payloads will demonstrate the potential for significant system compromise, such as loss of availability or unauthorized access.

A key component of the project is its sustainability aspect. The demonstration system and accompanying educational materials will be shared with Computer Science faculty at Marshall University, enabling reuse in future courses, outreach activities, and student-led events. By making the materials accessible to other students and instructors, the project extends its impact beyond a single semester and contributes to ongoing cybersecurity awareness and education initiatives.

**Keywords:** Cybersecurity, Awareness, Hacking, Prevention, Education

## UGO-04

**Title:** Evaluating Potential for Workplace Injury Among Healthcare Workers Through Functional and Isokinetic Performance Assessment

**Authors/Presenters:** Dr. Suzanne Konz - konz@marshall.edu, Mia McBride - mcbride42@marshall.edu

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Context:** Healthcare workers who regularly perform manual patient transfers are at an increased risk for sustaining work-place injury due to the physical demands of these tasks. Previous research has focused on the lumbar region and lacks examination of the lower extremities. This study replicated the sustained forces experienced by healthcare workers during manual patient transfers using isokinetic assessment and evaluated musculoskeletal injury risk associated with fatigue-induced compensatory movement strategies. We hypothesized that healthcare workers and healthcare students would demonstrate significant strength and endurance weaknesses and compensatory strategies that reflect movement patterns associated with an elevated risk of musculoskeletal injury.

**Methods:** This cross-sectional laboratory study examined relationships between lower-extremity muscular strength and endurance and functional performance in healthcare workers and students aged 18-40 years. Inclusion criteria included experience in performing manual patient transfers and the ability to currently perform isokinetic testing. Participants were recruited via flyers distributed around Marshall University's campus, and via word-of-mouth. All participants provided written informed consent. This study was approved by Marshall University IRB (#2383976).

**Testing** took place in Marshall's Biomechanics Laboratory, where participants completed a demographic survey and two randomized assessments: (i) a 60-second chair-squat test and (ii) isokinetic knee flexion/extension testing at 60 degrees per second for each limb. During the chair squat test, total reps were counted for the participants. Participants were instructed to sit down and stand up in a chair, performing as many repetitions as possible within 60 seconds. During the isokinetic test, participants performed a familiarization trial before then performing 15 maximal repetitions of knee extension/flexion. Primary dependent variables measured included peak torque and power during the isokinetic test, and number of repetitions in the chair-squat test.

**Results:** A total of 6 participants (mean age  $23.7 \pm 3.4$  years) participated in testing. When comparing the results from isokinetic testing, group mean fatigue index was 8%. Excluding an outlier, group mean fatigue index spikes to 25.5%, suggesting variation in fatigue responses among participants. Functional performance in the 60-second chair squat had similar variation in number of reps performed in the time limit, but did not have statistical significance due to the reduced sample size.

**Conclusions:** Fatigue index measures how much applied torque decreases throughout the test. Individuals with low resistance to fatigue are less likely to perform well on a functional test such as the 60-second chair squat. The isokinetic leg extension/flexion test observes muscular endurance in the lower extremity through fatigue index, which may inform evaluations of increased risk of work-related injury for at-risk occupations.

**Keywords:** healthcare, patient transfer, workplace injury

## UGO-05

**Title:** Effects of Pectoralis Minor Length on Scapular Kinematics

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**Research Sponsors:** Not Applicable

### Abstract

**Background:** Shoulder pain has been correlated to scapular kinematics; more specifically, reduced scapular motion during elevation has been shown to be related to shoulder pain. Pectoralis minor length has also been associated with anterior shoulder pain. However, the association between pectoralis minor length and scapular kinematics has not been fully explored. This lack of data has prompted this study to explore the effects of pectoralis minor length on scapular kinematics.

**Methods:** Eighteen (18) individuals without shoulder pain participated in this study. Scapular kinematics were measured with an electromagnetic tracking system. Pectoralis minor length was measured using digital calipers. A two-way repeated measures ANOVA was used to determine differences in scapular position by arm elevation angle and pectoralis minor length.

**Results:** Participants experienced a pattern of scapular upward rotation, posterior tilt, and external rotation during arm elevation. There was no difference between the group with shorter and longer pectoralis minor length in scapular upward rotation ( $P > 0.05$ ). The group with shorter pectoralis minor length had less scapular posterior tilt at 45° (mean difference =  $2.9 \pm 4.6^\circ$ ,  $P = 0.030$ ) and 90° (mean difference =  $3.6 \pm 5.1^\circ$ ,  $P = 0.041$ ) arm elevation. The shorter pectoralis minor group also had less scapular external rotation at 45° (mean difference =  $7.1 \pm 5.8^\circ$ ,  $P = 0.036$ ) and 90° (mean difference =  $8.4 \pm 5.7^\circ$ ,  $P = 0.003$ ).

**Discussion:** The group with shorter pectoralis minor length had less scapular posterior tilt and external rotation, which is consistent in patients with anterior shoulder pain.

**Keywords:** pectoralis minor length, scapular kinematics

## UGO-06

**Title:** Perceived Supervisor Support and Fun at Work: Effects on Performance and Retention

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### Abstract

Fluegge (2008) surveyed working college students and found fun at work was positively associated with organizational citizenship behavior (OCB) and indirectly related to task performance through its relation to work positive job-related affect and engagement. Workplace fun has also been associated with task performance and OCB among employees in the oil and gas industry (Zia-ur-Rehman et al., 2023) and employees from large tech companies, especially when their values aligned with the organization's (Tang et al., 2017).

There is a lack of research examining the relation between workplace fun and counterproductive work behaviors (CWB), but research shows that OCB and CWB are negatively related, meaning that behaviors associated with higher levels of OCB will likely correspond with lower levels of CWB (Dalal, 2005; Sypniewska, 2020).

Hypothesis 1. Employees who attend more group outings will report higher levels of performance, higher levels of OCB, and lower levels of counterproductive behaviors (CWB).

A comprehensive literature review by Maurya et al. (2024) emphasized the consistent findings linking perceived organizational support to more OCB, better work performance, and lower turnover intentions. Afzal et al. (2019) found that perceived supervisor support was a direct and indirect predictor (through self-efficacy) of task performance among private university teachers. Liaw, Chi, & Chuang (2009) found higher levels of perceived supervisor support were related to better performance among service employees. Zhu et al. (2023) found hotel employees with more supportive supervisors tended to exhibit more employee helping behaviors (similar to OCBs). Eisenberger et al. (2002) found that retail workers with more supportive supervisors tended to believe the organization was more supportive, which was related to lower turnover.

Hypothesis 2. Employees who report higher levels of perceived supervisor support will report higher levels of performance, higher levels of OCBs, lower levels of CWB, and lower turnover intentions.

### Method and Plan

Staff from a residential treatment facility in southern Ohio are currently completing a survey through Qualtrics with empirically validated survey measures of all the constructs in the hypotheses. Raw data from the completed surveys will be stored in Dropbox, which is then separated from identifying information by the Principal Investigator (PI). Data collection will be completed by March 6th, followed by data analyses conducted by the Research Assistants (RA's). Results will be available before the conference.

**Keywords:** Healthcare; Performance; Turnover; Organizational Citizenship Behavior; Counterproductive Work Behavior

## UGO-07

**Title:** Organizational Factors That Influence Quality of Care, Burnout, and Secondary Traumatic Stress

**Authors/Presenters:** Jamie Menshouse menshousej@marshall.edu & Jamie Cook cook629@marshall.edu

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### Abstract

Among behavioral health providers, burnout and secondary traumatic stress (STS) are prevalent and associated with feeling unprepared to provide services in under-resourced systems (Johansen et al., 2019; SAMHSA, 2022; Wies et al., 2023). Burnout and STS levels may differ based on sex assigned at birth and job status. Carmassi et al. (2022) found that female healthcare workers reported higher STS than males, while doctors reported higher burnout levels than nurses.

Compassion satisfaction (i.e., being satisfied with your ability to provide services) and worker engagement are associated with lower STS and burnout among healthcare workers (Rattrie et al., 2020; Schaufeli & Baker, 2004; Schaufeli et al., 2022; Zakeri et al., 2021), which are significant predictors of less positive patient outcomes (Sayer et al., 2024).

H1: Staff who report more quality of care (Recovery Self-Assessment) will tend to report significantly lower burnout (Maslach Burnout Inventory) and lower secondary traumatic stress (Secondary Traumatic Stress Scale).

H2: Staff who report higher engagement (Dedication Subscale of the Utrecht Work Engagement Scale) will tend to report significantly lower burnout (Maslach Burnout Inventory) and lower secondary traumatic stress (Secondary Traumatic Stress Scale).

RQ1. Will these relationships be stronger for women compared to men?

Accreditation often results in positive institutional changes that correlate with increased staff satisfaction (Batista et al., 2021; Alhawajreh et al., 2005; Boon, 2022) and less burnout among healthcare staff (Shoenberger et al., 2024; SAMHSA, 2022, Rattrie et al., 2020; Wies et al., 2024). However, the relationship between accreditation and healthcare staff outcomes differs based on job role. Accreditation appears to improve satisfaction with pay, rewards, and communication for nursing staff, but not for nursing management (Batista et al., 2020). Nevertheless, how nursing management rates the positive impact of accreditation has been shown to be a stronger predictor of patients' quality of care than the perceived impact of accreditation among nursing staff with no leadership roles. (Alhawajreh et al., 2025). Accreditation itself may largely affect frontline healthcare workers, whereas perceptions about its impact may be more consequential for management.

H4: Staff with higher ratings for the positive impact of CARF (CARF Evaluation Scale) will report significantly lower burnout (Maslach Burnout Inventory), lower secondary trauma (Secondary Traumatic Stress Scale), and higher levels of quality of care (Recovery Self-Assessment).

H5: These relations will be moderated by job role.

**Method and Plan:**

To study these relationships, staff from a residential treatment facility for men in southern Ohio are completing a survey with empirically validated measures for all relevant constructs. Data collection will be completed by March 6th, and full results will be available before the conference.

**Keywords:** Burnout, Secondary Traumatic Stress, Accreditation, Dedication, Quality of Care

## UGO-08

**Title:** The City of Facebook? Does social media impact the decision-making of municipal government officials: a West Virginia Case Study.

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

As traditional local news declines, Facebook has become a primary platform for communication between municipal governments and residents. This study examines how Facebook influences local governance in West Virginia municipalities. Using a qualitative research design, semi-structured interviews were conducted with sixteen elected councilmembers from nine cities across the state. The interview instrument was informed by agenda-setting theory and explored officials' experiences with social media, public engagement, and decision-making.

Findings indicate that Facebook functions as a modern town square by shaping public discussion and information flow. While Facebook input rarely changed formal votes, it influenced officials' behavior by affecting agenda setting, preparation, and communication strategies. Only three participants reported changing a vote because of Facebook, and the average perceived influence score was low. Officials also noted that Facebook amplifies a vocal minority, intensifying NIMBY-style opposition. Although harassment was common, direct threats were less frequent. Despite these challenges, most participants believed Facebook increases transparency and accountability and expect its influence to continue growing.

Overall, Facebook does not govern municipalities directly but meaningfully shapes the context in which local decisions are made.

**Keywords:** Social Media, Policy, Municipal Government, Agenda-Setting, Public Influence

## UGO-09

**Title:** Omotenashi and Japanese Convenience Store Culture into North America: Seven & i Holding's Advertising Strategy

**Authors/Presenters:** Haley Elkins elkins163@marshall.edu

**College/School:** College of Liberal Arts

**Mentors:** Dr Natsuki Anderson

**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### Abstract

The purpose of this project is to examine the advertising strategies being used by Seven & i Holdings, the parent company of 7-Eleven, for the introduction of Japanese convenience store culture and food product to North American customer base. This study investigates the advertising strategies Seven & i Holdings employs to cater to North American consumers and concerns surrounding it and focuses on Japanese “omotenashi” convenience store culture and how foods like onigiri are being introduced through localization efforts.

**Keywords:** 1) 「おもてなし」 omotenashi: Customer service 2) おにぎり (おにぎり) onigiri: Japanese handheld rice snack often featuring meat or vegetable filling. 3) 広告 (こうこく) koukoku: Advertisement 4) 戦略 (せんりやく) senryaku: Strategy 5) コンビニ Konbini: Japanese convenience store

## UGO-10

**Title:** Adolescent Binge Drinking Engages Microglial Phagocytic Pathways to Reshape Astrocyte-Synapse Morphology

**Authors/Presenters:** Lucas Stanley (stanley254@marshall.edu), Jake Seagraves (seagraves17@marshall.edu), Quentin Owens (owens180@marshall.edu), Shayna Tysor (stysor02@rams.shepherd.edu), Olivia Coulter (coulter31@marshall.edu), Hannah Sexton (sextonh@marshall.edu), Alyssa Ihl

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**Sponsoring Institutions:** School of Medicine

**Research Sponsors:** Hershel 'Woody' Williams Veterans Affairs Medical Center, Huntington, WV

### Abstract

Adolescence is a crucial period for neurological development. Binge drinking during this period has been associated with long-term disruption of neuronal function within brain regions involved in learning and memory. Appropriate neuronal function requires healthy synapses ensheathed by peripheral astrocytic processes (PAPs). Loss of PAP support of synapses can result in significant neuronal dysregulation. Using a rat model of adolescent binge drinking (AIE), we have demonstrated chronic PAP-synaptic decoupling within the hippocampus, a brain region critical for learning and memory. However, the underlying mechanisms driving this decoupling are unclear. Recently, using a cocaine model, it was demonstrated that PAP-synaptic decoupling can occur as a consequence of microglial phagocytosis. Our study seeks to understand whether microglial phagocytosis similarly occurs following AIE. Female rats received AIE and an intracranial injection of a viral vector expressing GFP to visualize the astrocyte outer membrane within the hippocampus. Animals were allowed to mature into adulthood. Brains were harvested, prepared for immunohistochemistry, and visualized using confocal microscopy. 3D renderings of astrocytes and microglia were generated using Imaris. GFP+ astrocytic membrane marker engulfment by microglia was quantified. Preliminary data demonstrates that AIE increases microglial engulfment of GFP+ when compared to water controls, suggesting that the loss of PAP-synaptic decoupling may be a consequence of microglial removal of PAPs. More work is required to determine why microglial pruning of PAPs occurs and how these events contribute to the synaptic and neuronal changes that persist into adulthood.

**Keywords:** astrocytes, microglia, phagocytosis, ethanol

## GO-01

**Title:** Piano Music from Around the World

**Authors/Presenters:** James Steven F. Sibbaluca - sibbaluca@marshall.edu

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**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Not Applicable

### **Abstract**

This presentation will feature a musical performance of compositions for solo piano from around the world. Composers include Frédéric Chopin (Poland/France), Sergei Rachmaninoff (Russia/United States), Carmencita Arambulo (Philippines), and Pascual Gimeno (Spain). The stylistic range spans the gamut from early Romantic era character piece to a jazz-influenced 21st-century work.

**Keywords:** Music, Piano, Chopin, Rachmaninoff, Performance

## GO-02

**Title:** Boeing's Ongoing Quality Control Challenges

**Authors/Presenters:** Julie Shuck shuck10@marshall.edu

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**Sponsoring Institutions:** College of Business

**Research Sponsors:** Not Applicable

### **Abstract**

Boeing has been subject to several court cases in recent years linked to quality control failures leading to two fatal crashes and a door plug malfunction causing several minor injuries. This presentation analyzes Boeing's failures to comply with FAA regulations and how they can improve processes now and in the future to prevent these accidents from occurring.

**Keywords:** Boeing Quality Control FAA Compliance

## GO-04

**Title:** Improving fluency and comprehension skills to second grade students with integration of technology

**Authors/Presenters:** Name: Annjela Twardy Email:Twardy2@Marshall.edu

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**Mentors:** Dr. Yvonne Skoretz

**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

This action research study examined the impact of technology integration on reading fluency and comprehension skills among second-grade students. The purpose of the study was to determine whether structured use of digital tools during small-group literacy instruction could improve students reading performance and engagement. Data was collected through multiple measures, including observational notes, student responses, and formative literacy assessments. These instructions occurred twice weekly among small-group settings to allow close monitoring among student progression. Findings indicated that technology-enhanced instruction support student participation, peer interaction, and growth in reading fluency and comprehension. This study highlights the instructional value of technology integration in early literacy instruction and suggests that structured digital supports can enhance both skill development and student motivation. The results may inform elementary educators seeking effective strategies to strengthen reading outcomes in primary classrooms.

**Keywords:** Literacy skills improve through technology

## GO-05

**Title:** Adult Literacy Education

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**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

This is an exploration on the state of adult literacy in modern America. Starting with the function of existing adult literacy programs, the project moves into the type of people who need these programs, effective instructional practices, and the lack of sound research surrounding adult literacy. America's current literacy crisis begins in elementary and secondary school. When students do not receive proper accommodations, instruction, or supports, we eventually see these same students become adults who lack functional literacy skills. The goal of this project is to dive deeper into the intricacies of adult literacy and the importance of shifting our focus towards the struggling adults in need of proper literacy education.

**Keywords:** Adult literacy curriculum and instruction

## GO-06

**Title:** Story Boards For Young Children

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**Mentors:** Isaac Larison

**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

Using literature from the United States Board on Books for Young People, the process of creating and utilizing story boards in the classroom setting is analyzed. The implementation of story boards is examined within the primary school setting. The execution of story boards is examined within small groups and large group, while focusing on building comprehension skills with various types of learners. An example is shown by utilizing a book by Shinsuke Yoshitake, *The Boring Book*, to represent how to create the story boards and figure out the process of sequencing the story while relying on illustrations throughout the text.

**Keywords:** Story Boards, Comprehension, Story Sequencing

## GO-07

**Title:** Assessing the Role of Text Complexity in Social Studies Reading Comprehension in Ohio

**Authors/Presenters:** Elizabeth Crawford, barnhart14@marshall.edu

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**Mentors:** Monica DellaMea

**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

Text complexity is not often considered when developing a social studies curriculum. By attempting to fill a gap in the literature on text complexity in social studies curriculum, a quantitative likert scale survey was distributed to public school teachers in grades PreK through twelfth grade in Ohio. The research aimed to determine if the social studies curriculum teachers used was judged to be too complex regarding reading and reading comprehension. The seven-question likert scale survey sent out to Ohio teachers PreK through twelfth grade found that the social studies curriculum is complex in terms of reading and reading comprehension. The findings suggest that text complexity in Ohio's social studies curriculum needs to be evaluated so that students can read and comprehend the material.

**Keywords:** text complexity, social studies, reading, education, Ohio

## GO-08

**Title:** Appalachian Students' Persistence Following Academic Probation: A Phenomenological Inquiry

**Authors/Presenters:** Sam Holiskey, holiskey@marshall.edu; Dr. Kristi McLeod, kristi.mcleod@marshall.edu

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**Mentors:** Dr. Kristi McLeod, kristi.mcleod@marshall.edu

**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### Abstract

**Intro:** While prior investigations of undergraduate academic probation explore the experiences of students currently serving an academic probation term, fewer studies investigate the subset of students who return to good standing and achieve graduation following academic probation placement. Additionally, the experiences of Appalachian students who graduate following academic probation placement are understudied. Accordingly, this study aims to explore the factors leading undergraduate students within Appalachia to struggle academically and investigate what graduates and likely graduates from this population are doing to overcome those factors and achieve degree completion.

**Method:** This qualitative phenomenological study employs semi-structured interviews to ask students from counties within the Appalachian region about their experiences before, during, and after academic probation. The study employs Vincent Tinto's theory of institutional departure to explore the factors leading to Appalachian students' academic difficulties and recoveries. Participants were recruited from an Appalachian higher education institution and inclusion criteria included Appalachian county residence; prior placement on academic probation; graduation at any GPA; or likely graduation, defined as a 3.0 GPA or above in 90+ credit hours. Exclusion criteria included probation at an institution other than the research site, assignment to the study author as an advisee, and previous academic suspension if that suspension involved an involuntary departure from the university. Four participants were interviewed, and no interviews were excluded.

**Results:** Findings suggest that academic unpreparedness, COVID-19 instructional disruptions, and financial barriers were contributing factors to students' academic probation placement. Increased campus involvement, positive social support, the academic probation process serving as a wake-up call, and increased access to major-specific courses were precursors to academic recovery. Participants demonstrated a recovery focus and an orientation toward learning as an inherently rewarding pursuit following the academic probation process, contributing to their academic recovery. The reduced financial aid eligibility characterizing the academic probation process presented a structural barrier to Appalachian students' continued degree progression.

**Discussion:** This investigation contributes to theory by positing that within Appalachia, Alexander Astin's involvement theory may be a more suitable framework for struggling students' experiences than Vincent Tinto's widely-adopted theory of institutional departure, because students in this population demonstrate greater academic achievement following greater campus involvement and use of campus facilities such as the library. Additionally, this study indicates that second-chance funding for Appalachian students previously placed on academic probation may enable more Appalachian students to complete their education following placement on academic probation.

**Keywords:** Academic probation, Academic recovery, Student success

**Title:** Vibia Perpetua - The Exception or the Rule

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**Research Sponsors:** Not Applicable

**Abstract**

In the early third century, the Roman empire was at war with a growing religious movement, Christianity. A relative newcomer to the society of Rome, Jesus' adventures taking place during the reign of Tiberius, this religion was in contention with the state sponsored gods of old and the extensive network of religious bureaucracy that had developed over the preceding centuries. While hostility is widely accepted, just how aggressive was the Roman machine attempting to snuff out this new religion? What can we discover by looking at source material, as well as secondary sources about the treatment of both exceptional examples of early Christians and everyday folks that were beginning to cross from the religion of old to this new doctrine delivered by a Nazareth carpenter and his disciples. This piece is an attempt to both highlight examples of the treatment of early Christians by the Romans and add nuance and depth to a larger conversation often saddled with spectacle and perhaps, even some propaganda.

Some sources used are contemporary to the first three centuries of the Roman Empire. Tacitus, Pliny, and Suetonius add insight into some of the events that set the tone leading into the third century. From the third century, The Passions of (Vibia) Perpetua act as a window into one of the most notable cases of Christian martyrdom. Secondary and Tertiary sources provide a nuanced look into the larger Roman ideology against Christianity and its spread. These sources coming together to provide a "top down" look at the rise of early Christianity, the "acceptable" amount of deviation from state religion, the exceptional treatment of those that strayed too far, and the process to progress between those two points.

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**Keywords:** Perpetua, Rome, Christianity, Persecution, Martyrdom

## GO-10

**Title:** Humanity, Political Paranoia, and the Uncanny in No, I'm Not a Human

**Authors/Presenters:** Jacob Wood, wood233@marshall.edu

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### Abstract

In a tumultuous environment where the temperatures rise daily and dangerous human-like creatures roam, what makes one human? No, I'm Not a Human (2025) is a first-person horror visual novel that follows the protagonist trying to survive in his own home while the sun threatens to explode, temperatures inching higher daily. A news report flashes on the protagonist's television, declaring that creatures called Visitors who look like humans are digging up from the ground and threatening to kill anyone who lets them in their homes. The protagonist learns more about these creatures through daily news reports that detail what to spot in people that one may suspect is a Visitor. Though the Federal Emergency Management Agency (FEMA) gives physical signs to look for in Visitors, one cannot decipher between human and Visitor by physical appearance alone. The protagonist immediately bears distrust in anyone who shows up to his door, but he has no other choice than to let others in, whether it be by his own empathy or fear of dying alone. No, I'm Not a Human (NINAH) celebrates what it means to be human and the qualities thereof, such as grief and empathy, through the disastrous environment, weaponized paranoia, and discriminatory distrust of fellow man.

**Keywords:** humanity, uncanny, uncanny valley, video games, post-humanism

## GO-11

**Title:** War-Induced Trauma: Ancient Perspectives and Modern Experiences

**Authors/Presenters:** Abigail Parks parks64@marshall.edu

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

As we seek new ways to help our own soldiers and veterans, a consideration of how earlier societies both prosecuted and processed war may offer new ideas and perspectives. Ancient war literature provides a gateway to shifting our perspectives and changing the ways in which we think about, discuss, and participate in war. To uncover the ways in which modern attitudes and tactics of war negatively impact, not just individuals, but society and culture as a whole, my research project performs thorough analysis of ancient attitudes, beliefs, and customs of war through Greek and Latin epic is conducted in an attempt to answer the following questions: are we able to properly compare ancient tactics and customs of war to modern ones? Or are they too different to be compared? Were ancient attitudes towards war better than our modern attitudes? If so, how were their attitudes indicative of a healthier, more socially competent culture? Lastly, this project addresses the question of how war-induced trauma manifests and expresses itself on the individual and cultural levels.

This project, with a focus on the Homeric epic tradition argues that ancient forms of polytheistic religion and ritual practices provided for a more complex, and emotionally aware society that regarded the necessity of war while also being critical of its chaotic and harmful nature. In the Iliad and the Odyssey, traumatic emotions, such as panic, fear, and conflict, are personified and deified. This practice provides insight into how the ancient Greeks were able to hold an open dialogue with their emotions and more easily process those inner thoughts of turmoil. This personification and deification allowed the ancient Greeks to separate their actions in war from their actions outside of wartime. By projecting their emotions outside of themselves, the ancient Greeks were able to cognitively process their trauma while preserving a strong sense of self-worth. My presentation will end with some suggestions for how this research project elucidates our understanding of the psychological impact of war and how its impacts may differ from ancient to modern society.

**Keywords:** ancient, war, epic, trauma, emotions

## GO-12

**Title:** From 'Addicts' to 'People With Substance Use Disorders?' A Longitudinal Analysis of Newspaper Language in West Virginia

**Authors/Presenters:** Dr. Caitlin Trombley (trombley@marshall.edu), Candace Smith (smith2499@marshall.edu), Alyssa Rayburn

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**Mentors:** Dr. Caitlin Trombley, trombley@marshall.edu

**Sponsoring Institutions:** Department of Sociology and Anthropology

**Research Sponsors:** Not Applicable

### **Abstract**

West Virginia has been disproportionately affected by the opioid crisis for more than two decades, shaping public discourse, policy response, and community identity. Although person-first, non-stigmatizing language has gained traction recently, media outlets remain a key public institution through which stigma can be reproduced and legitimized given their influential role in shaping public perceptions and policy support. This study conducts a longitudinal content analysis of drug-related reporting in The Herald-Dispatch, one of the region's oldest and most influential newspapers, spanning 1999 to 2025. Through systematic coding of language patterns, descriptive terms, and narrative framing, this research examines how representations of people who use drugs have evolved during all three waves of the opioid epidemic.

**Keywords:** stigma, opioid epidemic, person-first language, content analysis

## GO-13

**Title:** Adolescent Alcohol Exposure Disrupts Astrocyte-Synaptic Structural And Functional Coupling In The Male Dorsal Hippocampus

**Authors/Presenters:** O. Coulter 1,2, C.D. Walker 3, T. Carter 1, H.G. Sexton 1,2, I. Parsons 1, W.C. Risher 1, B.J. Henderson 1, and M-L Risher 1,2

**College/School:** School of Medicine

**Mentors:** Dr. Mary Louise Risher

**Sponsoring Institutions:** School of Medicine

**Research Sponsors:** 1 Joan C. Edwards School of Medicine, Marshall University, Biomedical Sciences, Huntington, WV; 2 Hershel "Woody" Williams Veterans Affairs Medical Center, Huntington, WV; 3 The Medical University of South Carolina, Charleston, SC

### Abstract

**Introduction:** Adolescence is a crucial period of neurological development. Binge-drinking during this period has been associated with long-term disruption of neuronal and cognitive function. How non-neuronal cells contribute to these deficits remains understudied despite growing evidence that astrocytes are important regulators of neuronal function. Astrocytes are emerging as critical regulators of numerous behavioral and cognitive outcomes. However, the role of astrocytes in regulating more complex behaviors remains understudied. Our previous data demonstrate that adolescent intermittent ethanol (AIE) disrupts peripheral astrocyte process (PAP)-synaptic proximity in a subregion-dependent manner and impairs astrocyte function in the dorsal hippocampal (dHipp). The ensheathment and proximity of peripheral astrocyte processes (PAPs) to synapses facilitates necessary bidirectional crosstalk that occurs through the release of neuro- and gliotransmitters and astrocyte Ca<sup>2+</sup> signaling. These processes create a neuronal-astrocyte feed-forward circuit that contributes to the regulation of neuronal activity.

**Methods:** Male Sprague Dawley rats received hippocampal intracranial injections of various adeno-associated viruses: astrocyte-specific Ca<sup>2+</sup> indicator (GCaMP6f), adenosine sensor (GRAB\_Ado1.0) + fiber, and hM3D(Gq). Adolescent rats received EtOH (5g/kg) or water intermittently via gavage over 16 days followed by a 26-day washout period. Rats then performed the contextual fear conditioning task with simultaneous fiber photometry recordings following clozapine-n-oxide administration. A subset of brains were prepared for immunohistochemistry, stimulated emission depletion (STED) microscopy, and slice physiology.

**Results:** We demonstrate that PAPs physically and functionally decouple from synapses. Moreover, astrocytes show reduced Ca<sup>2+</sup> responsivity to neuronal activation in the dorsal hippocampus despite increased glutamate availability within the synaptic cleft. We show that the EtOH-induced reduction in astrocyte Ca<sup>2+</sup> signaling is not due to a loss of astrocyte membrane-bound glutamatergic receptors or transporters. These changes coincide with EtOH-induced deficits in fear acquisition in the contextual fear conditioning task that are attenuated through chemogenetic recovery of astrocyte Ca<sup>2+</sup> activity. Using fiber photometry during this task, we are also able to demonstrate how chemogenetic astrocyte activation impacts downstream changes in gliotransmitter release and synaptic glutamate release that may be contributing to the attenuation of AIE-induced deficits in fear acquisition.

**Conclusions:** These data emphasize a critical role for astrocyte-synaptic crosstalk in the regulation of behavior and demonstrates the potential of non-neuronal targeted treatments to improve decision-making outcomes during abstinence. Future studies will explore the downstream effects of astrocyte chemogenetic activation and the modulation of astrocyte activation across the fear-related circuit.

**Keywords:** adolescence, alcohol, astrocyte, behavior

## GO-14

**Title:** Formulation And In Vitro Assessment Of 5-Fluorouracil Loaded Plga Nanoparticles For Hepatic Resistin Modulation In Nafld

**Authors/Presenters:** KAVYA YANDAPALLI & yandapalli@marshall.edu

**College/School:** School of Pharmacy

**Mentors:** Dr. Cynthia B. Jones & jonescy@marshall.edu

**Sponsoring Institutions:** School of Pharmacy

**Research Sponsors:** Not Applicable

### Abstract

**Background:** Non-Alcoholic Fatty Liver Disease (NAFLD) is a progressive metabolic disorder characterized by excessive lipid accumulation in hepatocytes and chronic inflammation. Elevated hepatic resistin levels have been implicated in insulin resistance and disease progression in NAFLD. Targeted nanoparticle-based drug delivery systems offer a promising strategy to enhance therapeutic efficacy while minimizing systemic toxicity. Poly(lactic-co-glycolic acid) (PLGA) nanoparticles are biodegradable and biocompatible carriers capable of providing controlled and sustained drug release. This study focuses on the formulation of 5-Fluorouracil (5-FU)-loaded PLGA nanoparticles and their potential role in modulating hepatic resistin levels relevant to NAFLD.

**Objective:** The objective of this study is to formulate and characterize 5-FU-loaded PLGA nanoparticles and evaluate their in vitro performance for controlled drug release. We hypothesize that encapsulating 5-FU within PLGA nanoparticles will enhance formulation stability, improve drug loading, and provide sustained release suitable for hepatic therapeutic applications.

**Methods:** 5-FU-loaded PLGA nanoparticles were prepared using the double emulsion (W/O/W) solvent evaporation method. The nanoparticles were characterized for particle size, polydispersity index, and zeta potential using dynamic light scattering. Morphological analysis was performed using Scanning Electron Microscopy (SEM). Drug encapsulation efficiency and loading capacity were determined using High-Performance Liquid Chromatography (HPLC). In vitro drug release studies were conducted to evaluate release kinetics and assess sustained drug delivery potential.

**Results:** The formulated 5-FU-loaded PLGA nanoparticles demonstrated uniform particle size distribution, acceptable zeta potential values, and spherical morphology. Encapsulation efficiency and drug loading confirmed successful incorporation of 5-FU within the polymeric matrix. In vitro release studies indicated a sustained drug release profile over an extended period, supporting the suitability of the formulation for controlled therapeutic applications.

**Conclusions:** The successful formulation and in vitro evaluation of 5-FU-loaded PLGA nanoparticles highlight their potential as a controlled drug delivery system for hepatic applications relevant to NAFLD. Sustained drug release characteristics suggest that nanoparticle-mediated delivery may offer advantages over conventional administration. Further studies will focus on advanced in vitro modeling and future in vivo validation to explore translational potential.

**Keywords:** PLGA, 5-Fluorouracil, NAFLD, resistin modulation, nanoparticle drug delivery, sustained release.

**Title:** Formulation and Physicochemical Characterization of a Quercus infectoria–Chitosan Topical Gel for Wound Healing Applications

**Authors/Presenters:** Rani Naga Rakshitha Tillapudi (tillapudi@marshall.edu)

**College/School:** School of Pharmacy

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**Sponsoring Institutions:** School of Pharmacy

**Research Sponsors:** Not Applicable

**Abstract**

**Background:** Effective wound healing requires stable topical formulations that support tissue repair while maintaining drug integrity. Quercus infectoria (QI) is known for its antimicrobial and anti-inflammatory properties, largely attributed to its tannin-rich composition. Chitosan, a biocompatible and biodegradable polymer, is widely used in topical delivery systems due to its film-forming ability and inherent wound-healing support. Incorporating QI into a chitosan hydrogel may provide a stable and suitable platform for wound management.

**Objective:** This study aimed to formulate a chitosan-based topical gel incorporating Quercus infectoria extract and to evaluate its physicochemical characteristics and drug content to determine its suitability for topical wound applications.

**Methods:** A QI-loaded chitosan hydrogel was formulated using a controlled gelation process. The formulation was evaluated for pH, spreadability, homogeneity, and physical stability. Stability studies were conducted to assess formulation integrity over time. Fourier Transform Infrared (FTIR) spectroscopy was performed to investigate potential chemical interactions between QI and chitosan. Drug content analysis was carried out using UV–visible spectrophotometry to quantify the amount of QI present in the gel and ensure uniform distribution within the formulation.

**Results:** The QI–chitosan gel demonstrated a pH within the acceptable range for topical skin application and exhibited appropriate spreadability for ease of use. Stability studies indicated no visible phase separation or degradation during the study period. FTIR analysis confirmed compatibility between QI and chitosan without evidence of significant chemical interaction. Spectrophotometric drug content analysis verified uniform incorporation of QI within the gel matrix.

**Conclusion:** The formulated QI–chitosan topical gel exhibited favorable physicochemical properties, stability, and consistent drug content, supporting its potential as a topical wound-healing formulation. These findings establish a basis for future biological evaluation and therapeutic efficacy studies.

**Keywords:** Quercus infectoria; chitosan; topical hydrogel; wound healing; physicochemical evaluation; stability studies.

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

**Authors/Presenters:** Kamal Kasi (kasi@marshall.edu)

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**Sponsoring Institutions:** School of Pharmacy

**Research Sponsors:** Not Applicable

**Abstract**

**Background:** Chronic and non-healing wounds, particularly those associated with diabetes and metabolic dysfunction, remain a significant clinical challenge due to persistent inflammation, infection, and impaired cellular repair mechanisms. Silver nanoparticles (AgNPs) are well known for their broad-spectrum antimicrobial activity and wound-healing support. Previous investigations in our laboratory demonstrated that 5-Fluorouracil (5FU), an antimetabolite widely used in cancer therapy, may modulate fibroblast proliferation and inflammatory signaling pathways relevant to tissue repair. Integrating 5FU with AgNPs may provide a synergistic therapeutic approach for enhancing delayed wound healing.

**Objective:** The present study aimed to formulate and characterize 5FU-loaded silver nanoparticles and investigate their potential therapeutic efficacy in an in vitro model of delayed wound healing. We propose that topical delivery of 5FU via AgNPs can simultaneously reduce microbial burden and regulate fibroblast activity, thereby improving wound closure outcomes.

**Methods:** 5FU-incorporated AgNPs were prepared using an environmentally friendly green synthesis method. Physicochemical characterization was performed using ultraviolet-visible (UV-Vis) spectroscopy, scanning electron microscopy (SEM), and zeta potential analysis to determine particle size, morphology, surface charge, and stability. Drug incorporation efficiency was also assessed. Biological evaluation was conducted using a scratch wound assay in adult human dermal fibroblast cultures to monitor cellular migration and proliferation. Cytotoxicity and cell viability were determined using the MTT assay.

**Results:** Characterization studies confirmed the successful production of stable, uniformly distributed nanoparticles with an average diameter of approximately 25 nm. In vitro findings revealed significantly improved fibroblast migration and proliferation in treated groups compared with untreated controls. Optimized nanoparticle concentrations maintained high cell viability while minimizing cytotoxic effects.

**Conclusion:** The developed 5FU-loaded silver nanoparticles demonstrate promising potential as a topical nanotherapeutic strategy for managing delayed wound healing. Future investigations will explore mechanistic pathways involving adipokines, particularly adiponectin, and extend evaluation to in vivo models to further assess clinical applicability.

**Keywords:** Silver nanoparticles; 5-Fluorouracil; impaired wound healing; fibroblast proliferation; nanotherapeutics; adiponectin.

## GO-17

**Title:** Determining Methamphetamine Doses that Produce Comparable and Stable Locomotor Activity in Male and Female Rats

**Authors/Presenters:** Isaac Dickess (dickess16@marshall.edu), Jessica Branford (branford@marshall.edu), Hannah Turner (turner325@marshall.edu), Michael Berquist (mberquistii@south.edu), Todd H. Davies (daviest@marshall.edu), Michael D. Hambuchen (hambuchen@marshall.edu)

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**Sponsoring Institutions:** School of Pharmacy

**Research Sponsors:** NASA WV EPSCoR Research Seed Grant

### Abstract

Biological women and female rats are more sensitive to the stimulant effects (including elevated locomotion) of methamphetamine (METH) than the biological males of each species. Considering METH-induced locomotor activity as a rat model of METH-induced agitation in humans, we aimed to determine doses which produce comparable effects in both sexes and to evaluate the consistency of these effects with repeated administration. Escalating injections of METH (0.1-1.0 mg/kg; subcutaneous) were administered to age-matched female and male rats, with the dose range producing predominantly locomotor activity rather than stereotyped movements. In females and males, respectively, 0.1 mg/kg and 0.32 mg/kg METH doses produced a comparable, statistically significant increase in locomotor activity compared to saline. Moreover, the maximal locomotor effect in males (0.75 mg/kg METH) was also comparable to the 0.32 mg/kg dose effect in females. Subsequent repetition of the lower, sex-equivalent METH dose produced similar activity between and within sexes over 3 days. These results will inform METH dosing in future sex-comparison studies.

**Keywords:** agitation, methamphetamine, rats, sex, locomotor activity

**GO-18**

**Title:** IRS vs. The Coca-Cola Company on transfer pricing business plan.

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**Sponsoring Institutions:** College of Business

**Research Sponsors:** Not Applicable

**Abstract**

It has not been published previously or under review for publication.

**Keywords:** Business, Legality, Taxation Dispute, Action

## GO-19

**Title:** Palantir Technologies LLC., and Violations of the Privacy Act of 1974 Analysis Memo

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**Sponsoring Institutions:** College of Business

**Research Sponsors:** Not Applicable

### Abstract

The purpose of our consultation analysis memo is to provide recommendations to Palantir Technologies Inc. and to develop solutions that satisfy the stakeholders. With the rising concern of violations of the Privacy Act of 1974 and Tax Code Section 6103 and 7213A. Tax Code Section 6103 and 7213A prohibits the release of sensitive tax information by IRS employees and addresses unauthorized inspection of tax returns. Senate Finance Committee Ron Wyden, Alexandria Ocasio-Cortez and eight other Members of Congress raised concerns of Palantir Technologies Inc. creating a “mega-database” for the IRS. Concerns are developing about American citizens sensitive tax information is going to be connected and shared with other data inside the government. Their argument is based on the “possibility” that the information provided in the database will be shared with other agencies. We recommend that Palantir Technologies Inc. prioritizes getting ahead of these concerns by providing insight into their operations and details that are permissible to be released to the public.

There is a risk that could expose Palantir Technology Inc. if the services provided do not consider setting up safeguards to the accessibility of sensitive information. A lack in this component could lead to violations of the Privacy Act of 1974 and the Tax Code Sections 6103 and 7231A. I highly recommend that Palantir Technology Inc. starts with forming a legal-technical team that can provide their expertise pertaining to the Privacy Act of 1974 and Tax Code Sections 6103 and 7213A. Palantir Technology Inc. is also recommended to complete a data inventory and mapping to locate and protect date accessibility. This ensures that proper permissions are put into place for access to information that is accessible for the appropriate agent and agency.

**Keywords:** Palantir, IRS, Memo, Consultation, Analysis

## GO-20

**Title:** Impact of Career Technical Education Instructors' Professional Experiences on Student Engagement

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**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### Abstract

Career and technical education (CTE) classrooms are frequently described as highly engaging because of hands-on, career-aligned learning, yet few studies specify the instructional mechanisms that shape engagement in daily practice. Guided by Social Cognitive Theory and engagement scholarship, this qualitative phenomenological pilot study explored how professional experiences of veteran CTE teachers influenced student engagement in technical classrooms. Data were collected from veteran CTE teachers through semi-structured interviews and field notes from classroom observations in Therapeutic Services and ProStart Culinary programs. Using a two-cycle coding process to identify patterns within and across cases, findings converged on three themes: (a) professional realism and real-world application, where instruction was anchored in workplace standards and expectations; (b) a supportive learning environment marked by rapport, humor, encouragement, and frequent feedback reduced performance anxiety; and (c) guided hands-on practice involving modeling, structured repetition, and peer mentorship. Although limited by a small sample, findings suggest that industry experience can function as an instructional asset that supports relevance, belonging, and persistence, with implications for CTE teacher learning focused on making engagement routines more intentional and transparent.

**Keywords:** Career and Technical Education (CTE), Student Engagement, CTE Teacher Identity, Teacher Self-Efficacy, Qualitative Phenomenology.

## GO-21

**Title:** Developing a Workplace and Life Skills Curriculum for 12th Grade Students

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**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

The Curriculum Development Blueprint proposes a 12th-grade workplace and life skills curriculum designed to prepare students who plan to enter the workforce or vocational training programs immediately after high school. The curriculum integrates communication, writing, collaboration, and problem-solving skills aligned to English Language Arts (ELA) standards to support postsecondary success. Grounded in a humanistic and experience-centered curriculum, this blueprint outlines the curriculum content, approach, and model, along with structures for collaborative development teams, stakeholder engagement, and a two-year phased implementation and evaluation timeline. Literature supporting a learner-centered and experience-centered curriculum design is synthesized to justify the model and provide evidence for successful implementation in diverse secondary settings. Example curriculum design tasks are included to illustrate alignment with goals and desired student outcomes. A persuasive discussion is provided to demonstrate why this curriculum is the best fit for students who often receive fewer workplace readiness opportunities within traditional academic pathways.

**Keywords:** workplace readiness, curriculum development, ELA integration, employability skills, high school seniors

## GO-22

**Title:** Student Retention in Music Programs: Demographics and Enrollment in an Intervention Rich District

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**Research Sponsors:** Not Applicable

### **Abstract**

This mixed-methods study examined student attrition within an intervention-rich music program. The district's retention strategies align with recommendations emphasized in the existing literature, particularly those addressing the financial cost of instruments and lack of transportation. However, disparities in enrollment persisted despite these efforts.

Quantitative analysis of five years of administrative data showed that while socioeconomic status, language status, and special education status remained predictive of withdrawal, they were secondary to structural factors. A random forest classifier identified grade level as the primary predictor of attrition. The study identified significant attrition spikes at the middle and high school transitions, including a high-intensity risk for Grade 6 English as a New Language students. Qualitative interviews with educators revealed that these patterns are driven by structural feasibility rather than material lack, specifically citing before-school rehearsal schedules, challenges communicating schedules with ENL parents, and conflicts with interscholastic sports. The results indicate that in an intervention-rich environment, further improvements in equity require shifting administrative focus from the provision of goods to the protection of instructional time within the master schedule.

**Keywords:** Music education, enrollment trends, attrition

## GO-23

**Title:** Embedding Structured Literacy Routines to Improve Algebra I Word Problem Comprehension

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**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### **Abstract**

Students in Algebra I often struggle with word problems, not because of limited mathematical ability, but because of the complex language demands embedded within them. This project explores how structured literacy routines can be embedded into Algebra I instruction to improve comprehension, access, and overall problem-solving success.

Grounded in disciplinary literacy research and principles outlined by Powell and Driver (2015) and the National Council of Teachers of Mathematics (2014), this work examines the role of explicit vocabulary instruction, structured discussion, annotation strategies, and sentence frames in supporting mathematical understanding. Research suggests that many students experience cognitive overload when attempting to decode unfamiliar terminology, multi-step directions, and abstract phrasing within word problems. By embedding small, consistent literacy supports directly into math instruction, teachers can reduce linguistic barriers while maintaining mathematical rigor.

The presentation outlines a practical step-by-step classroom routine implemented in an Algebra I setting. Students are guided to read problems aloud, annotate key information, identify and discuss vocabulary, restate the problem in their own words, and explain their reasoning using structured sentence frames. These routines are designed to prevent shutdown, increase engagement, and strengthen conceptual understanding without turning mathematics into an English Language Arts lesson.

Teacher-ready handouts and implementation materials are included to demonstrate how literacy routines can be integrated seamlessly into existing instruction. The project highlights how structured academic talk and written explanations promote deeper reasoning, align with social constructivist theory, and support equitable access for diverse learners, including students receiving special education services.

This work contributes to ongoing conversations about cross-disciplinary literacy and offers a practical, research-informed model for supporting mathematical comprehension in secondary classrooms.

**Keywords:** Disciplinary Literacy, Academic Vocabulary, Reading Comprehension in Mathematics, Structured Academic Discourse, Content-Area Literacy

## GO-24

**Title:** Tobacco Screening in Marshall University Department of Family Medicine - A Quality Improvement Project

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**Sponsoring Institutions:** School of Medicine

**Research Sponsors:** Not Applicable

### Abstract

Tobacco use related to cigarette smoking causes more than 480,000 deaths every year in the United States. The US spends more than \$240 billion each year in health care costs related to tobacco use. The USPSTF recommends that clinicians ask all adult patients about tobacco use and design an appropriate treatment plan. National Tier 3 Standards for Tobacco Screening are >90%, our institution did not meet this standard prior to the beginning of this project. Our aim is to increase and maintain tobacco screening rates of >90% (national Tier 3 standard) for the patients in the Family Medicine Department through November 1, 2025. Our project progressed through four PDSA cycles. Each PDSA cycle resulted in an overall improvement in tobacco screening rates, with an overall increase of 82.1% to 94.5% from June 2024 to September 2025. This exceeded the AIM Statement but also lead to a decrease of the tobacco counseling metrics. Cycle 4, which is ongoing, also has the potential to overburden the scheduling system. Overall, these interventions seem to be capable of long-term success and therefore better patient care, but the process may need to be refined to alleviate unintended consequences.

**Keywords:** Tobacco Screening, Quality Improvement, Primary Care, PDSA Cycles, Preventive Health Care

## UGP-01

**Title:** Fabric of Hope

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**Mentors:** Sandra Reed, Kyle Dyer

**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Not Applicable

### Abstract

When presented with the opportunity to once again create a poster for Black History Month I was eager to get started. I was intrigued by the Centennial theme and the open-ended subject matter. When researching ideas and narrowing them down the choices, I decided on quilts and began ideation. I decided to incorporate all the past poster winners as a way to honor them and their history. After a conversation with my professor to make sure my idea was feasible, I went for it.

What shape and pattern should the quilt blocks be? I started researching quilt blocks and the meanings behind them. I was also thinking of not only the past but also the future of Black History, and what that could mean to those that view my poster. The quilt blocks would represent the past, so what could I use to represent the future. I used a little girl dressed in yellow, the color of safety and hope, to symbolize the future of Black History Month and possibilities that it holds.

Quilt blocks hold a profound place in African American history. Especially during the era of slavery and the Underground Railroad. Quilting was not only a creative expression but also a means of survival and communication. According to the Smithsonian Center for Folklife and Cultural Heritage, quilt patterns are believed to have served as coded messages to guide enslaved people toward freedom. The patterns that I have included in my design are just a few of those various designs. Bow tie, Shoofly, Monkey Wrench, Nine Patch, Bear's Paw, Crossroads, Flying Geese, Drunkards Path, Log Cabin, Signature, and the Star have all have their place in my poster design.

1. Bow Tie may signal the need for a disguise or a change of clothing.
2. Shoofly signaled that a home offered help to escaping slaves.
3. Monkey Wrench is believed to be one of the first quilt codes signaling to gather the tools you need to escape.
4. Nine Patch is most commonly used for practicality, and as a basic quilt pattern, it was once a signal for slaves that there was a community garden on property.
5. Bear's Paw signals a trail or path and is sometimes believed to signify a way through the wilderness or follow the bear tracks through the mountains to water and food.
6. Crossroads can either represent multiply paths or a specific destination with one example being Cleveland, Ohio as a key stop to freedom.
7. Flying Geese was used for direction and migration to point the way for slaves toward freedom.
8. Drunkards Path represents a winding, zigzag path, which could be used to show the need to take an indirect route.
9. Log Cabin symbolizes seek shelter now, and you are safe to speak with the people at this location.
10. Signature Patch is a signature of who made the quilt, or a message written on the quilt usually marked with a year.
11. Star is a signal to follow the North Star to freedom.

These quilts would often hang on the clothesline or the windowsill along the trail that represented the Underground Railroad. Women would gather to sew with their nimble fingers, working in secret, and armed with only a needle and thread. They were engaging in a visual language and doing their part to help slaves find freedom. All while creating a sense of community, an opportunity for storytelling, and cultural preservation. Each stitch carried meaning, linking generations through a shared history. Today these quilt blocks are a celebration of a shared history and future. During Black History Month these are symbols of ingenuity and courage. They remind us that art

can be a powerful form of resistance and that creativity often flourishes under oppression. By studying these patterns that are so commonly used today, we honor the resourcefulness of African Americans who turned fabric into a language of liberation.

#### Citations

May 3, 2019 | Marie Claire Bryant | Comments. "Underground Railroad Quilt Codes: What We Know, What We Believe, and What Inspires Us." Smithsonian Center for Folklife and Cult

**Keywords:** Quilt, fabric, underground, history, hope

## UGP-02

**Title:** Rebranding Lilly's Place: Strengthening Community Awareness and Support Through Design Thinking

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**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Marshall University Undergraduate creative discovery and research scholar award

### Abstract

Lilly's Place is a Huntington-based nonprofit organization that provides specialized medical care for infants diagnosed with Neonatal Abstinence Syndrome (NAS) while also offering critical support services for families navigating substance use recovery. As the opioid crisis continues to disproportionately impact Appalachian communities, organizations such as Lilly's Place play an essential role in both infant health outcomes and long-term family restoration. Despite the organization's life-saving mission, Lilly's Place faces challenges related to limited public awareness, inconsistent messaging, and donor engagement due to an outdated brand identity that no longer reflects its evolving scope of services, including expanded counselling and recovery support.

This project proposes a research-driven organizational rebrand grounded in design thinking methodology and strategic communication principles. Conducted over the Spring 2026 semester, the project follows a five-phase design thinking framework: research and discovery, needs definition, ideation, testing, and final implementation. Data collection methods include stakeholder interviews with Lilly's Place staff, board members, donors, and community partners, as well as surveys and a comprehensive content audit of existing marketing and communication materials. Nonprofit branding literature and comparative analysis of peer healthcare organizations will inform the development of visual and messaging prototypes. The rebranding process will result in the creation of a comprehensive brand identity package, including an updated logo, typography system, color palette, messaging framework, and donor-facing communication templates. Prototypes will be tested with organizational stakeholders to ensure alignment with community perception, organizational mission, and fundraising goals. Final deliverables will also include brand usage guidelines and strategic recommendations for future digital and print communications. By strengthening Lilly's Place's public-facing identity, this project aims to improve organizational visibility, increase donor trust, and enhance community engagement in Huntington's broader response to the opioid epidemic. The project will serve as a fresh new brand identity demonstrating how research-based design thinking can be used as a strategic communication tool to enhance nonprofit sustainability, stakeholder trust, and mission-driven storytelling within a regional healthcare context.

**Keywords:** Design Thinking, Nonprofit Branding, Strategic Communication, Visual Identity

### UGP-03

**Title:** Trauma Responsiveness to Domestic Violence in Huntington, West Virginia

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**Sponsoring Institutions:** College of Arts & Media

**Research Sponsors:** Branches Domestic Violence Shelter, Huntington, W.Va.

#### **Abstract**

This exploratory study, conducted in partnership with Branches Domestic Violence Shelter, examines how four key community pillars – businesses, faith-based communities, neighborhoods, and service providers – understand and practice trauma responsiveness. Together, this body of research underscores the need to evaluate trauma responsiveness across multiple community sectors, provides an initial examination of the four key pillars in Huntington, West Virginia, and provides a foundation for a larger, more comprehensive study of the 5-county area Branches serves. A mixed-methods approach that combines qualitative interviews and quantitative survey data was used to assess trauma responsiveness across the four community pillars. Results suggest large gaps in training, eligible sources, and protocols associated with trauma response. The study provides three recommendations to ensure a consistent community-wide response, including offering standardized, adaptable, trauma-informed training; beginner lessons for less-exposed community pillars; and an advanced training program for service providers. Despite limitations such as a small sample size and topic sensitivity regarding domestic violence, the findings in the study offer actionable recommendations for improving community pillar-specific trauma responsiveness to better support domestic violence survivors. The research will be used to advance Branches Domestic Violence Shelter's Building Trauma-Responsive Communities Initiative throughout Cabell, Wayne, Putnam, Lincoln, and Mason Counties.

**Keywords:** Trauma, Responsiveness, Community, Domestic, Violence

## UGP-04

**Title:** Assessing the Impact of Spaceflight and Shielding Materials on Agricultural Soil Microorganisms

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**Sponsoring Institutions:** College of Engineering & Computer Sciences, College of Science

**Research Sponsors:** NASA West Virginia Space Grant Consortium

### Abstract

A new era is upon us in space exploration, with a prioritized focus on crewed missions to the moon, Mars and other planetary bodies. Planetary protection policies are in place to mitigate microbial contamination to extra-terrestrial bodies and back to Earth. Crop growth is mission critical for sustaining human presence on the lunar or Mars surface and plant-supporting soil microorganisms capable of surviving the space environment pose a planetary protection risk. NASA's RockSat program has provided a unique avenue for researching this topic. In summer 2026, a sounding rocket will be sent into sub-orbital Earth, during which a payload will be exposed to the radiation, microgravity, vacuum, and temperatures of the space environment at 190km. Marshall University is including six canisters of agricultural soil on this payload. This research seeks to reveal the identity of agricultural microorganisms that could pose a planetary protection threat. We designed and manufactured canisters made from two materials: Poly-Ether-Ether-Ketone (PEEK) and aluminum. We hypothesize that aluminum will most effectively shield radiation found in sub-orbital space, and therefore microbial viability will be greater compared to PEEK. We also hypothesize lower cell viability post-space flight due to the physical stressors of the launch compared to ground controls. Viability will be measured through plating of soil on nutrient rich tryptic soy agar (TSA) microbiological media, quantifying the number of colony forming units (CFUs). We will then extract DNA from bacterial isolates and amplify their 16S rRNA gene using PCR, followed by sequencing. Here we present our canister design and cultivation strategy to identify bacteria that can survive spaceflight and to determine which material is better suited for understanding risks to planetary protection. This research aims to catalogue agricultural soil microorganisms that are resilient to environmental stressors of space that pose a planetary protection risk. Forward microbial contamination of extraterrestrial bodies would compromise the search for extant life and origin of life research.

**Keywords:** Astrobiology, Microorganisms, Agriculture, Space

## UGP-05

**Title:** Study to regulate the chemokine binding protein to restrain inflammation

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** Marshall University

### Abstract

**Background:** Chronic inflammation underlies the progression of multiple cardiometabolic and inflammatory diseases. So, managing uncontrolled inflammation is crucial to prevent disease progression and improve quality of life, especially in a rural population like West Virginia, which has a poor ranking in overall health and in the prevalence of chronic diseases. Chemokines are central regulators of immune cell trafficking and inflammatory amplification. Persistent activation of the C-C motif chemokine ligand 5- C-C motif chemokine receptor 5 (CCL5-CCR5) signaling axis promotes macrophage recruitment and sustained cytokine release, contributing to tissue damage. Targeting chemokine signaling using novel biomolecular platforms represents a promising strategy to restrain pathological inflammation.

**Aim:** The aim of this study was to engineer and validate a DNA nanostructure-based platform capable of conjugating the chemokine ligand CCL5 to modulate CCR5-mediated inflammatory signaling.

**Methods:** A six-helix DNA nanostructure was designed and assembled using DNA origami methodology. Assembly efficiency and structural integrity were validated by polyacrylamide gel electrophoresis, followed by SYBR Gold staining. Covalent conjugation of CCL5 to the DNA nanostructure was achieved using carbodiimide-mediated chemistry, employing EDC and Sulfo-NHS to activate carboxyl groups and promote stable amide bond formation with primary amines on the CCL5 protein. Conjugation products were analyzed by electrophoretic mobility.

**Results:** The six-helix DNA nanostructure was successfully constructed and exhibited consistent electrophoretic mobility, confirming structural stability. Following carbodiimide-mediated conjugation, our results showed that the six-helix DNA-CCL5 nanostructure demonstrated a distinct electrophoretic shift, corresponding to the formation of a higher molecular weight compared to the DNA nanostructure.

**Conclusion:** This study establishes a robust DNA nanostructure platform for chemokine conjugation and provides a foundation for future investigations into CCR5 receptor engagement and regulation of inflammatory signaling. These findings support the development of innovative tools for improving chronic inflammation. The novel DNA nanostructure construct, which specifically targets CC-chemokine-CCR5 interactions, may offer effective and safe anti-inflammatory-antiretroviral treatment strategies in clinical settings.

**Keywords:** Inflammation, DNA nanostructure, chemokine, chemokine ligand

## UGP-06

**Title:** AI-based Super-Resolution of Single Tooth RGB Images

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**Research Sponsors:** Not Applicable

### Abstract

Improving image quality is important because low-quality dental images can limit the accuracy of automated systems. This work focuses on improving the clarity of dental images using super-resolution processing. Super-resolution increases the detail and sharpness of an image by generating a higher-quality version from a lower-quality starting image. Although numerous super-resolution techniques exist for natural and medical images, work on super-resolution of RGB tooth images is limited. A few of the recently released datasets contain high-quality tooth images. Since no paired low-/high-resolution dataset exists, we simulate low-resolution images by artificially reducing the quality of the high-resolution images. Then we assess how well standard super-resolution techniques from general computer vision perform on the RGB dental imaging.

**Keywords:** Tooth super resolution, single tooth superresolution

## UGP-07

**Title:** RGB D Guided Insufficient Ballast Detection for Improved Fault Classification in Rail Environments

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**Research Sponsors:** NASA West Virginia Space Grant Consortium, NASA Agreement # 80NSSC25M7079, U.S. Army Engineer Research and Development Center (ERDC), grant #W912HZ249C006, and Undergraduate Creative Discovery Scholar and Undergraduate Research Fall 2025 Scholar Award.

### Abstract

Insufficient ballast detection in real world railroad environments is a difficult computer vision task due to lighting variability, occlusions, irregular terrain geometry, and the limited spatial context available in two dimensional imagery. Traditional RGB based inspection methods often struggle to differentiate between surface debris, shadowed regions, or uneven gravel and true cases of insufficient ballast. These ambiguities reduce classification reliability and limit the effectiveness of automated inspection systems. To address these challenges, this study presents a depth assisted detection framework that combines RGB information with depth measurements to improve both robustness and accuracy in fault detection.

The proposed method uses an improved YOLO detector supported by a depth correction procedure that removes tilt, roll, and geometric inconsistencies from raw RealSense depth data. After correction, each pixel's depth value becomes a consistent reference across frames, allowing the system to capture actual three dimensional structure rather than depending solely on appearance based cues. By integrating corrected depth information with RGB features, the framework can distinguish flat surface artifacts from structural depressions that indicate insufficient ballast.

Experimental results on a labeled RealSense dataset show that using RGB D information leads to higher precision and higher recall compared with an RGB only model. These improvements demonstrate the benefit of incorporating depth guided reasoning when identifying insufficient ballast in complex rail environments. The method also offers a scalable and data efficient foundation for future depth aware inspection systems that seek to improve the reliability and interpretability of automated railroad maintenance.

**Keywords:** Machine Learning, RGBD, YOLO

## UGP-08

**Title:** The Thermal Theatrics: Hydraulic Vulcanization Press

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** Richwood Industries

### Abstract

The Thermal Theatrics are developing a custom H-Frame hydraulic vulcanization press that will curb bottlenecks in the production floor at Richwood Industries. Currently, the project is well into the fabrication of the press, and the specimen is located at the sponsor's facility. Accomplishments thus far include the preliminary assembly of the main frame structure that include load bearing crossbeams and the front/back portions of the frame made of ½" thick A36 steel plate. Approximately 95% of the raw material needed for the project has been received and the only material that will need to be purchased moving forward are small items that were possibly overlooked earlier in the design process. Machining required for the Lower and Upper Platens has been completed and the team has begun assembling each subassembly. Once the plates are fully machined, including all tapped holes, the spacer plates, calcium-silicate insulation, and platens may be introduced to the overall assembly.

**Keywords:** Mechanical Engineering, Thermal Systems, Fabrication, Capstone, Electrical Systems

## UGP-09

**Title:** Methane on the map

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** Not Applicable

### Abstract

Methane (CH<sub>4</sub>) is a potent greenhouse gas with a global warming potential significantly higher than carbon dioxide over a 20-year period [1], making it an important target for emissions monitoring. In addition to its environmental impact, methane presents safety risks due to its flammability at elevated concentrations. Abandoned oil and gas wells, landfill sites, and remote natural areas can act as unmonitored methane emission sources. In regions such as West Virginia, where legacy energy infrastructure remains widespread, practical monitoring solutions are particularly valuable. However, many high-precision methane detection systems are expensive and complex, limiting their feasibility for widespread, distributed deployment. This project focuses on the design and development of a low-cost, portable methane detection device capable of detecting methane concentrations at or above 100 ppm (0.01% by volume). The system integrates a non-dispersive infrared (NDIR) methane sensor with an ESP32 microcontroller for real-time data acquisition, processing, and storage. NDIR sensing technology was selected for its improved selectivity and reduced cross-sensitivity compared to many low-cost sensor alternatives [2]. To improve measurement reliability, temperature and relative humidity are recorded alongside methane concentration data. The device operates using a regulated 12V power subsystem to ensure stable sensor and microcontroller performance. Measurement data are logged locally to an SD card, enabling long-term environmental monitoring and post-processing analysis. All electronics are housed within a durable PETG enclosure designed for outdoor deployment, with an intended protection level comparable to IP66 standards for resistance to dust and water ingress [3]. Although formal calibration and quantitative accuracy testing have not yet been completed, a structured validation procedure has been planned to characterize sensor response, repeatability, and environmental sensitivity. Future testing will establish performance benchmarks and guide further system refinement. Overall, this research demonstrates the feasibility of developing an affordable and scalable methane detection platform suitable for distributed environmental monitoring. Future work will focus on improving detection sensitivity at lower concentration levels, conducting field validation at orphan well sites in West Virginia, and optimizing durability for extended outdoor operation.

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**Keywords:** Methane Sensor

## UGP-10

**Title:** Nonlinear Approach for Defect Detection of Structures Using Impact Echo Detection and Impact Hammer

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** Not Applicable

### Abstract

This project presents the design, fabrication, integration, and preliminary validation of a nonlinear impact-echo system for nondestructive testing (NDT) of concrete structures. Conducted at Marshall University within the Weisberg Department of Mechanical and Industrial Engineering, the work supports the growing need for reliable defect detection in aging infrastructure. The primary objective was to develop a portable, repeatable, and ergonomically sound impact hammer capable of delivering controlled excitation to a concrete specimen, while implementing a signal processing framework to identify subsurface voids and delaminations through nonlinear frequency analysis.

The mechanical subsystem consists of a spring-loaded, tubular impact hammer designed to generate repeatable force levels via discrete locking set points. Two functional prototypes (V1.0 and V1.1) were fabricated primarily using PLA and PETG through additive manufacturing to validate geometry, tolerances, and subsystem integration. Prototype V1.1 introduced an improved locking mechanism to ensure consistent spring compression and enhanced sliding tolerances. While the 3D printed components enabled rapid iteration, localized cracking near screw interfaces revealed material limitations under cyclic impact loading. The final design transitions to machined aluminum, steel, and UHMW polymer components to improve structural integrity and fatigue resistance while maintaining portability (<1 lb), ergonomic constraints (<2 in diameter), and a maximum required spring compression force of 40 lbf.

The instrumentation subsystem integrates a single-axis accelerometer, signal conditioner, laptop interface, Audacity for data acquisition, and MATLAB for post-processing. Impact-induced stress waves are recorded as time-domain signals and analyzed using both Fast Fourier Transform (FFT) for linear spectral characterization and Hilbert-Huang Transform (HHT) methods for detecting nonlinear phenomena such as harmonic generation and frequency modulation. System integration validated signal transmission from accelerometer to MATLAB, with ongoing hardware refinement focused on connector reliability and noise mitigation.

Experimental validation was performed on a 32 in × 16 in × 8 in concrete slab (27.5 MPa compressive strength) containing a 12 in × 12 in × 1/8 in expanded polystyrene insert embedded 1 in beneath the surface to simulate delamination. At intact regions, spectral analysis revealed a dominant resonance near 5 kHz, corresponding to full-thickness behavior. In contrast, impacts above the artificial defect produced an early peak near 1 kHz, confirming reduced effective thickness and successful void detection. Increased excitation amplitude further generated additional harmonic content, supporting the nonlinear diagnostic approach.

Midterm milestones were achieved, including a functioning prototype, validated repeatable force output, operational locking mechanism, and working MATLAB analysis code. Remaining work includes final machining, full subsystem integration, expanded nonlinear analysis validation, exploring its potential use for batteries, and preparation for final demonstration. Overall, results indicate that the combined mechanical and signal-processing approach provides a viable framework for repeatable, portable nonlinear impact-echo testing.

PLEASE KEEP IN MIND THAT THIS IS A DEVELOPING PROJECT THAT HAS NOT YET REACHED ITS FINAL STAGES

**Keywords:** Impact-Echo, Detection, Hammer, Analysis, and Electronics

## UGP-11

**Title:** Comparison of Deep Learning Models for Defect Detection on Railroads

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** U.S. Army Engineer Research and Development Center

### Abstract

Railways play a crucial role in transportation, tasked with transporting large amounts of cargo daily. Due to the constant use of the railways, parts will often break overtime and can potentially hurt the passengers and the cargo. One critical component is the railroad ties, which would have traditionally required a human to individually inspect each tie to verify its quality. This approach can be potentially dangerous, exhausting and prone to errors. This resea examines the use of automated detection through object detection models trained to find defections on the railroad ties. Two object detection models are compared, You Only Look Once v11 (YOLO) and Real-Time Detection Transformer (RT-DETR), to see how effective both models are in detection of defective railroad ties. Field testing footage was used to train the models over three defects: wood checks, wood decay, and ties. The model's metrics were tested and showed that YOLOv11 outperforms RT-DETR in F1-Score (0.9400), Precision (0.9696), and Mean Average Precision (mAP). YOLOv11 achieves a mAP50 of 0.9530 and a mAP50-95 of 0.9014. The only metric RT-DETR beat YOLOv11 was Recall with 0.9119 and 0.9104 respectively. This demonstrates that object detection models, especially YOLOv11, are effective in detecting defects on the railway ties and can be utilized to enhance railroad safety and maintenance without being too expensive.

**Keywords:** Deep Learning, Computer Vision, Object Detection, Vision Transformers

## UGP-12

**Title:** Design of an Automated Industrial Waste Management System for Nucor

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**Research Sponsors:** Nucor Steel West Virginia

### Abstract

Steel manufacturing operations at Nucor's Tandem Cold Mill (TCM) facility generate metallic sludge through magnetic separation of roll coolant recirculation systems. Currently, sludge accumulates in separator collection saddles and requires manual transfer and disposal, increasing operator exposure, spill potential, and process inefficiency. This project presents the multidisciplinary design of an automated industrial waste management system intended to safely consolidate sludge from five separator collection points into a centralized storage tank using an integrated mechanical, simulation, electrical, and PLC-based control architecture.

The proposed system includes industrial piping networks, air-operated double diaphragm pumps, centralized storage infrastructure, and discrete level sensing. A preliminary mechanical layout defines tank placement, pump configuration, piping routes, and containment strategy to support scalable industrial implementation. To evaluate system feasibility prior to physical fabrication, a dynamic process model was developed in FlexSim to simulate sludge transfer behavior, flow continuity, and disturbance response. This simulation environment enables validation of routing logic, sequencing behavior, and overall material movement between saddle tanks and the centralized holding tank.

A structured ladder-style control architecture was developed in MATLAB/Simulink to regulate tank level using discrete Low-Low, Low, High, and High-High thresholds. The controller governs pump activation and deactivation, overflow prevention, dry-run interlocks, and alarm annunciation while maintaining tank level within defined operating bounds. Signal standardization and modular architecture were implemented to support compatibility with Siemens PLC export through PLC Coder, enabling transition to deployment within TIA Portal. In parallel, a comprehensive standards and compliance matrix was constructed to align environmental regulations, mechanical piping standards, safety requirements, and PLC programming conventions with specific design elements, ensuring traceability between regulatory expectations and engineered solutions.

Integrated simulation testing demonstrated stable pump sequencing, overflow protection below maximum tank capacity, alarm activation within defined response time targets, and recovery following inflow disturbances. Preliminary cost analysis estimates a total material investment of approximately \$68,800, supporting economic feasibility for industrial-scale implementation.

This work demonstrates a cohesive, system-level engineering approach to automated sludge handling in steel manufacturing. By integrating mechanical design, dynamic simulation, structured control logic, compliance alignment, and cost evaluation within a unified framework, the project establishes a technically defensible and implementation-ready foundation for improving operational safety, environmental control, and process efficiency in Nucor's industrial waste management operations.

**Keywords:** Industrial Waste Management, PLC-Based Control Systems, Sludge Handling Automation, System-Level Engineering Design, Process Simulation and Modeling

## UGP-13

**Title:** Graphic User Interface For Drone Swarm Control

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**Research Sponsors:** WV NASA

### **Abstract**

This project focuses on the development of a graphical user interface (GUI) designed to provide intuitive, high-level control of a multi-drone swarm. As drones become increasingly integrated into industries such as agriculture, construction, and search and rescue, the need for interfaces that simplify the management of complex swarm behaviors continues to grow. To address this challenge, we developed a map-based control system that allows an operator to manage swarm activity using simple gestures and high-level commands. The GUI supports real-time visualization of drone positions, dynamic formation adjustments, obstacle avoidance, and control over inter-drone spacing, altitude, and target locations. By abstracting advanced swarm-control algorithms behind an intuitive GUI, this system significantly lowers the barrier to effective drone swarm deployment in practical, real-world applications.

**Keywords:** Drones, Drone Swarm, Obstacle Avoidance, Human Robot Interaction

## UGP-14

**Title:** Project H.E.R.D. (Hostile-UAS Emulation & Resilience Development)

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** DroneTrace

### Abstract

Project H.E.R.D. (Hostile-UAS Emulation & Resilience Development) is a senior design project sponsored by DroneTrace and conducted as part of ME 453 Capstone II at Marshall University. The objective of this project is to design, build, and validate a custom quadcopter capable of autonomously delivering a minimum 14 oz payload to a GPS coordinate at 500 meters from start and return safely under controlled operation. The drone must be capable of maintaining stable flight with and without payload at a maximum height of 350 feet and a minimum height of 150 feet above ground level. The drone must be built from commercially available components and not exceed a budget of \$1500.

**Keywords:** UAS, UAV, drone, autonomous

## UGP-15

**Title:** Rapid Characterization of 3D-Printed Bone Scaffolds Using Neural Network-Based Image Analysis toward Enhanced Stem Cell Integration

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** NSF, NASA

### Abstract

Bone tissue engineering is an interdisciplinary field that aims to repair or replace damaged bone by combining biological and engineering techniques. A central strategy in this field is the use of scaffolds, three-dimensional structures that provide mechanical support and a surface for cell attachment, proliferation, and tissue formation. Advances in additive manufacturing have made 3D printing a valuable method for scaffold fabrication because it enables control of scaffold geometry, internal pattern, and porosity. These structural characteristics strongly influence both the scaffold's mechanical strength and its ability to support cell growth and nutrient transport. However, determining the optimal scaffold design remains a complex and time-consuming process, typically requiring repeated cycles of fabrication, imaging, mechanical testing, and biological experimentation. Recent research in bone tissue engineering has examined a broad range of scaffold materials and structures to balance mechanical stability with biological compatibility. Materials like polymer composites and synthetic bone substitutes have been extensively studied for their ability to replicate the mechanical properties of natural bone while gradually integrating with surrounding tissue. Additionally, studies have highlighted the significance of internal scaffold structure, including pore size, patterning, and overall porosity, in promoting cell attachment, nutrient diffusion, and vascularization. However, a major challenge in current research efforts is the time needed to experimentally evaluate each new scaffold design. This project proposes a computational system designed to accelerate scaffold evaluation. Building on prior work in scaffold fabrication and imaging, the proposed system integrates 3D printing, digital imaging, and Python-based computational modeling to rapidly characterize scaffold properties. Scaffolds will first be fabricated with varying materials and internal structures to generate a diverse dataset of designs. Images of each scaffold will then be processed and analyzed using a machine-learning algorithm that identifies visual features associated with structural properties, such as porosity, and predicts mechanical strength. Rather than relying on extensive physical testing, the model will provide rapid predictions about scaffold performance immediately after fabrication. In later stages of the project, scaffolds identified as structurally promising will undergo biological testing through extracellular matrix protein coating and stem cell seeding to evaluate their ability to support bone tissue growth. By linking computational predictions with biological outcomes, the system aims to create a feedback loop that improves scaffold design efficiency. Ultimately, this research seeks to demonstrate how integrating computational analysis with traditional experimental techniques can accelerate scaffold development and advance bone tissue engineering.

**Keywords:** Bone Tissue Engineering, 3D Printing, Stem Cell Integration

## UGP-16

**Title:** Men's Health in Appalachia: Chronic Disease and Behavioral Health Outcomes for Men Living in West Virginia

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Marshall University

### Abstract

People living in the Appalachian region experience higher rates of preventable diseases (e.g., heart disease, cancer, stroke, and diabetes) than the rest of the country. Poor health outcomes in the Appalachian region can be attributed to several determinants of health (i.e., social and environmental). In the Appalachian region, men bear a disproportionate burden of risk factors, incidence, morbidity, and mortality rates associated with disease (e.g., heart disease, cancer, diabetes, psychological, and behavioral health). It is reported that men also live on average 7 years less than women in the U.S. (CDC, 2023). The 2022 Behavior Risk Factor Surveillance System (BRFSS) reported that men in West Virginia had higher rates of obesity, tobacco use, substance use, risks of HIV, cardiovascular disease, diabetes, and kidney disease which leads to diminished/poor health status in comparison to women (WV BRFSS, 2022). In addition to chronic disease comorbidities, men's behavioral health in the Appalachian region is a concept that is under addressed. Specifically, Region 3 of the Appalachian region, which includes states such as Maryland, Pennsylvania, Virginia, and West Virginia, boasts higher rates of substance use disorder (alcohol, tobacco, and illicit drug use) than the national average (BHB, 2022).

Substance abuse disorder has been historically linked to mental health disorders for which rates of depression, suicide, serious mental illness/disturbances, and substance use are higher in the Appalachian region than the rest of the country (ARC, 2021). While men are often diagnosed with depression at lower rates than women, they are four times more likely to die by suicide than women (NIMH, 2022). Efforts to improve health outcomes among men are multifaceted. The goal of this research is to increase knowledge and raise awareness on men's health and the associated health outcomes for men in Appalachia. An analysis of the literature was performed to identify barriers and facilitators of men health outcomes in Appalachia and public health databases were accessed to gain a statistical overview of the current state of men's health. Three workshops were proposed to address men's health in Appalachia for the John Marshall Summer Research Award Program (Workshop I: Fostering connections- Engaging practitioners, academics, and community-based organizations that address men's health in Appalachia, Workshop II: Best practices for addressing men's mental health in Appalachia, and Workshop III: Cancer screening, early detection, and prevention strategies for men in Appalachia- A tailored approach).

**Keywords:** Men's Health, Appalachia, West Virginia, Chronic Disease, Behavioral Health

## UGP-17

**Title:** Relationship Between Pectoralis Minor Stiffness and Anterior Shoulder and Head Posture

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### **Abstract**

Fannin PT, Sullivan IA, Camarillo TJ, Timmons MK Marshall University COHP, School of Health and Movement Sciences

**Context:** Shoulder pain has been correlated to many causes as more theories are being developed and tested. In some of these theories, several studies have shown evidence of shoulder pain becoming associated with anterior shoulder posture. Due to constricted pectoralis minor muscle length, producing anterior shoulder posture. However, the effect of pectoralis minor stiffness on should posture has not been fully investigated. In this study, the aim is to measure the stiffness of the pectoralis minor muscle, using ultrasound elastography, to analyze any correlation with shoulder posture. By recording these factors, the relevance of this information can be used to understand the dynamics of the muscle and arch.

**Objective:** The Stiffness of the pectoralis minor muscle will be measured using ultrasound elastography. We can measure the posterior of our participants' shoulder posture by clinically assessing the subject and recording their anterior acromion by using their feet as a reference. We hypothesize that people with greater anterior shoulder posture will have greater relative strain due to a more constricted pectoralis minor muscle.

**Conclusions:** By understanding the relationship between shoulder pain and anterior posture of the shoulder. Healthcare providers can begin to develop treatment to ease the pectoralis minor as well as promote healthy habits to improve the quality of life and posture of patients.

**Keywords:** Pec Minor Stiffness Shoulder Posture

## UGP-18

**Title:** The Effects of Walking on Medial Collateral Ligament Stiffness

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Background:** The medial collateral ligament (MCL) plays a vital role in the stabilization of the knee joint. The main mechanism of injury is an acute valgus load to the knee. Walking produces a repeated valgus load on the MCL. The effects of repeated loading on the MCL has not been well studied. The purpose of this investigation is to study the effects of repeated submaximal loading while walking on the stiffness of the MCL.

**Methods:** This investigation used a repeated measures design. Thirteen (13) participants without knee injury are included in this study. Several B-mode with Elastography ultrasound images of both knees were captured prior to and after 15 minutes of walking on a treadmill. The ultrasound elastography images were imported into Image J to assess the ligament's relative stiffness during the valgus stress test. Paired T-test were used to determine the change in the MCL relative strain during the Valgus stress test

**Results:** The MCL relative strain during the knee valgus test was unchanged following the walking bout on either the right (mean difference =  $0.21 \pm 1.74$ ,  $P = 0.674$ ) or left (mean difference =  $0.22 \pm 0.50$ ,  $P = 0.142$ ) sides.

**Conclusion:** The results of the current study suggest that the MCL strain did not increase during the valgus stress test following the 15-minute walk. Ongoing work in this lab suggests that the MCL relative strain increases during the valgus stress test. More work is needed to determine the effect of repeated submaximal loads on the MCL.

**Keywords:** Medial Knee, Ultrasound Elastography, Exercise

## UGP-19

**Title:** The Assessment of Anterior Cruciate Ligament Stiffness Using Ultrasound Sheer Wave Elastography

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Context:** Anterior cruciate ligament (ACL) injuries are common among athletes. ACL injuries happen because of excessive knee internal rotation and anterior shear; due to increased strain in the ACL. The purpose of this study is to determine if ultrasound elastography can detect increased strain in the ACL during knee internal and external rotation.

**Methods:** Ultrasound images of the ACL were taken from both the anterior and posterior aspects of the knee. For the anterior aspects the knee was in 90° flexion, for the posterior view the knee was in 20° flexion. Images were taken with the ACL in a neutral position, internal and external rotation. Images were taken of both knees. The ultrasound shear wave elastography images were imported into Image J to perform the spectral analysis to measure strain within the ACL. ACL relative strain was calculated dividing the strain in the rotated position by the strain in the neutral position.

**Results:** Relative strain increased with both knee internal (mean =  $1.23 \pm 0.04$ ) and external (mean =  $1.11 \pm 0.06$ ) rotation. A greater increase in relative strain was found with knee internal rotation (mean difference = 0.12,  $F_{(9,1)} = 5.177$ ,  $P = 0.049$ ). No statistical difference was found between the anterior and posterior view of the ACL or between the right and left knees.

**Conclusion:** The results of this study suggest that ultrasound elastography could be used to assess injury to the ACL. Future work will need to include injured knees.

**Keywords:** ACL, Ultrasound, Elastography

## UGP-20

**Title:** MCL Stiffness and Strain

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** John Marshall Creative Discovery Grant

### Abstract

**Background:** The medial collateral ligament is one of the most common ligamentous injuries of the knee. The assessment of MCL injuries is performed using the valgus stress test. Injury to the MCL can also be diagnosed using B-Mode ultrasound imaging. Ultrasound strain elastography has been used to determine the stiffness of different tissue types. However, the ultrasound strain elastography has not been used to explore the MCL. The purpose of the current study is to explore the utility of US elastography in determine MCL stiffness during the knee valgus stress test.

**Methods:** Twenty-three (23) individuals without knee injury participated in the study. The repeated measures design was used in this investigation. The participant had several B-mode with ultrasound images of both knees made with elastography. The ultrasound images were made before and during performance of valgus stress tests that stress the ligament structures of the medial knee. The ultrasound images were imported into image J for spectral analysis.

**Results:** The width of the medial joint gap increased during the valgus stress test on the right (mean =  $2.87 \pm 0.92$ mm,  $P < 0.001$ ) and left (mean =  $2.81 \pm 0.98$ mm,  $P < 0.001$ ) knee. The relative strain increased during the valgus stress test in the right knee ( $0.34 \pm 0.54$ ,  $P = 0.035$ ) The increase on the left side did not reach statistical significance ( $0.21 \pm 0.47$ ,  $P = 0.062$ ).

**Conclusion:** The analysis of the ultrasound strain elastography showed that we can detect increased strain within the MCL during the valgus stress test. However, further investigation will need include injured MCL's.

**Keywords:** knee, medial collateral, ultrasound

## UGP-21

**Title:** Effects of Pectoralis Minor Length on Scapular Kinematics

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**Sponsoring Institutions:** College of Health Professions, School of Health and Movement Sciences

**Research Sponsors:** Not Applicable

### Abstract

**Background:** Shoulder pain has been correlated to scapular kinematics; more specifically, reduced scapular motion during elevation has been shown to be related to shoulder pain. Pectoralis minor length has also been associated with anterior shoulder pain. However, the association between pectoralis minor length and scapular kinematics has not been fully explored. This lack of data has prompted this study to explore the effects of pectoralis minor length on scapular kinematics.

**Methods:** Eighteen (18) individuals without shoulder pain participated in this study. Scapular kinematics were measured with an electromagnetic tracking system. Pectoralis minor length was measured using digital calipers. A two-way repeated measures ANOVA was used to determine differences in scapular position by arm elevation angle and pectoralis minor length.

**Results:** Participants experienced a pattern of scapular upward rotation, posterior tilt, and external rotation during arm elevation. There was no difference between the group with shorter and longer pectoralis minor length in scapular upward rotation ( $P > 0.05$ ). The group with shorter pectoralis minor length had less scapular posterior tilt at  $45^\circ$  (mean difference =  $2.9 \pm 4.6^\circ$ ,  $P = 0.030$ ) and  $90^\circ$  (mean difference =  $3.6 \pm 5.1^\circ$ ,  $P = 0.041$ ) arm elevation. The shorter pectoralis minor group also had less scapular external rotation at  $45^\circ$  (mean difference =  $7.1 \pm 5.8^\circ$ ,  $P = 0.036$ ) and  $90^\circ$  (mean difference =  $8.4 \pm 5.7^\circ$ ,  $P = 0.003$ ).

**Discussion:** The group with shorter pectoralis minor length had less scapular posterior tilt and external rotation, which is consistent in patients with anterior shoulder pain.

**Keywords:** pectoralis minor length, scapular kinematics

## UGP-22

**Title:** The Relationship Between Pectoralis Minor Stiffness and Glenohumeral External Rotation

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

External glenohumeral rotation at 90 degrees can sometimes provide pain for certain people, particularly those who utilize overhead motions consistently. This pain can prevent daily activities and possibly require medical diagnosis and treatment. The cause of this shoulder pain is typically linked to reduced glenohumeral external rotation. The purpose behind our current study is to assess the relationship between pectoralis minor stiffness and glenohumeral external rotation. This study utilized multiple measurements in assessing participants shoulder mobility as well as scapular mobility. Patients' scapulas were monitored in glenohumeral external rotation using electromagnetic tracking. While attached to these tracking systems, ultrasound elastography images were taken to compare the scapula's movement and the pectoralis minor stiffness at the same time.

Ten participants without a history of shoulder pain participated. The pectoralis minor relative strain increased with shoulder external rotation on the left side (mean difference  $24.98 \pm 23.83$ ,  $P = 0.009$ ) but the right side did not reach statical significance (mean difference  $19.83 \pm 30.37$ ,  $P = 0.069$ ). There was a weak negative correlation between glenohumeral external rotation and relative strain ( $R = -0.337$ ,  $P = 0.414$ ). The current data suggest that participants who have increased stiffness in the pectoralis minor have decreased glenohumeral external rotation. This correlation suggests that pectoralis minor stiffness may be contributing to shoulder pain. The limited sample size of this investigation calls for continued exploration

**Keywords:** Shoulder, Elastography, Pec Minor

## UGP-23

**Title:** A Literature Review of the Beneficence of Vocal Health Knowledge for Voice Users

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### **Abstract**

**Context:** Singers, actors, and other professional voice users should receive vocal health education, as they are at risk for voice fatigue, injury, or disorder due to overuse or misuse of the voice. Since this information may not be greatly emphasized in their professions, they may not understand the importance of taking care of the voice or what maintaining good vocal hygiene looks like.

**Objective:** This literature review explored vocal health knowledge and its impact on vocal hygiene and vocal quality among and professional voice users.

**Methods:** Some search terms used included “Voice,” “Vocal,” “Vocalist,” “Singer,” “Vocal Health Knowledge,” “Voice Knowledge,” “Voice Disorder,” “Vocal Pathology,” “Voice Pathology,” “Vocal Function,” “Voice Function,” and “Function of Voice.” Inclusion criteria were the following: the article is scholarly, was published in or translated to English, has a study population of professional or student voice users or singers, and pertains to vocal health knowledge and its effects. Exclusion criteria included: study is about vocal therapy techniques without implications to maintaining good vocal hygiene in professional voice users. Eleven articles were included in this study.

**Results:** Eleven articles met inclusion criteria for this study and were analyzed according to study population: a) singers, b) actors, and c) other professional voice users. Overall, singers showed more receptiveness to vocal health information in the included studies than actors or other professional voice users. Professional singers generally possessed more vocal health knowledge than those who are not singers. Vocal health education was effective when presented to groups with greater motivation to change their vocal behaviors.

**Conclusions:** Ultimately, the effectiveness of vocal health knowledge relies greatly on the motivation of the individual to implement care methods into their daily lives. Future research should explore the motivation of these populations (singers, actors, other professional voice users) to learn about and maintain good vocal hygiene. If these populations can become more motivated, it is likely that the effectiveness of vocal health education will increase.

**Keywords:** vocal health knowledge, vocal hygiene

## UGP-24

**Title:** Creatine Supplementations Effect on Maximal Grip Performance in Novice Rock Climbers

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**Research Sponsors:** Not Applicable

### Abstract

**Background:** Creatine is commonly supplemented by athletes to increase strength output in anaerobic activity due to its role in increasing the availability of phosphocreatine, speeding up ATP resynthesis. Rock climbers report supplementing creatine, but it is unclear if it significantly influences grip strength. This study aims to explore if four weeks of creatine supplementation (5 grams/daily) significantly increases maximal grip strength.

**Methods:** Ten (10) novice rock climbers ( $179 \pm 7.4$  cm,  $76.4 \pm 13$  kg,  $197 \pm 0.6$  yrs, 6 males, 4 females) participated in this pre/post intervention study. Grip strength testing was conducted before and after 4 weeks of creatine (5 grams/daily) or placebo supplementation to measure the changes in grip strength using a dynamometer and climbing specific hang board force plate. Max grip strength was measured with a hand grip dynamometer requiring one isometric pull per hand and measuring peak force. Maximal grip strength was evaluated using a hang board force plate. This test included another maximal isometric pull per hand, excluding the thumb and using a small wooden rung with peak force recorded over two trials. A repeated measure of analysis of variance (Re-ANOVA) was run to evaluate the effect of time and creatine supplementation. Statistical analysis was performed using SPSS 22.0 (SPSS, Chicago, IL). Statistical significance was determined at  $p < 0.05$ .

**Results:** Preliminary data of 6 subjects indicates minimal improvement in maximal grip strength following creatine supplementation. Left hand dynamometer testing showed no significant effect of time ( $p = .419$ ), but a significant interaction between time and creatine ( $p = .048$ ). The creatine groups grip strength decreased by  $3.23 \pm 2.00$  kg, while the placebo group increased by  $1.67 \pm 2.25$  kg. No significant effects were found for the right-hand dynamometer (time  $p = 0.929$ ; time x creatine  $p = .867$ ). Hang board testing showed no significant effects for the left hand (time  $p = 0.939$ ; time x creatine  $p = .350$ ) or right hand (time  $p = .871$ ; time x creatine  $p = .195$ ). A significant difference between right and left results was observed for hang board testing ( $p = .008$ )

**Discussion:** Overall, there was no significant improvement in max grip strength after 4 weeks of creatine supplementation. No significant effect on right hand dynamometer grip strength suggests that the significance on the left hand ( $p=.048$ ) may have been influenced by low subject numbers. Large standard deviations between subjects led to minimal significant effects. Hang board testing improvements likely reflected learning effects. A significant effect of hand side was found ( $p=.008$ ) indicating possible variable in grip strength. These findings suggest creatine may not cause a change in maximal grip strength; however, further research with greater subject number is needed.

**Keywords:** Grip strength, creatine, rock climbing, anaerobic performance

## UGP-25

**Title:** How Weight Distribution Differs Between High- and Low-Handicaps Across A Range Of Clubs

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Context:** Ground reaction forces (GRFs) and kinematics contribute significantly to golf swing performance and shot consistency. While prior research has analyzed GRF differences between skill levels, the integration of analyzing the pattern across a range of clubs is limited. The purpose of this study was to examine differences in weight distribution patterns, swing kinematics, and force timing characteristics between different skill levels across a range of clubs. It was hypothesized that low-handicap golfers would demonstrate greater peak vertical GRF, higher consistency in weight transfer patterns, and a linear progression of force timing changes as club length increases than compared to high-handicap golfers.

**Methods:** A cross-sectional study design was used. Participants (n = 9) were recruited via posters and in-person pleas. Each participant completed 25 swings, split into 5 separate trials. Each trial consisted of the participant hitting a Driver, 4-Iron, 6-iron, 8-Iron, and Pitching wedge in a randomized order, with each club being hit once per trial. Data was collected in a controlled laboratory using dual embedded force plates sampling at 1000 Hz, which was integrated with the Vicon software using a single marker to identify phasing within the swings. Simultaneously, kinematic data was collected using OpenCap via a dual iPhone system sampling at 60 Hz. Primary dependent variables included peak vertical GRF, rate of force development, and weight distribution consistency. Groups were assigned in correspondence to handicaps (High = 14 to 25, Low = +2 to 13). Data were time-aligned to swing events and analyzed using a mixed ANOVA.

**Results:** Low-handicap golfers demonstrated similar peak pelvis rotation with a driver during their backswing compared to high-handicap golfers (Low:  $-37.593 \pm 5.4^\circ$ , High:  $-35.47 \pm 8.8^\circ$ ) but displayed a difference within their follow-through (Low:  $117.28 \pm 29^\circ$ , High:  $96.78 \pm 16.6^\circ$ ). Pelvis range of motion followed a similar trend, with low-handicap golfers displaying larger rotational magnitudes ( $154.87 \pm 33.4^\circ$ ) than the high-handicap group ( $132.17 \pm 15.9^\circ$ ). A bigger difference in rotation angle between the shoulders and hips (X-Factor) was also present in the low-handicap golfers ( $101.96 \pm 45.22^\circ$ ) when compared to the high-handicap group ( $65.462 \pm 12.9^\circ$ ). The main effect of club was observed for pelvis rotation ( $p < 0.05$ ), with driver swings producing the greatest rotational magnitudes and shorter clubs following a linear regression.

**Conclusion:** Golfers with lower handicaps demonstrated greater rotational kinematics of the pelvis, alongside greater X-Factor values when compared to high-handicap golfers. Additionally, low-handicap golfers demonstrated higher consistency in rotational mechanics across repeated swings. These findings suggest that increased rotational mobility and improved kinematic sequencing may contribute to more efficient weight transfer mechanics and swing performance. Further analysis of ground reaction forces may provide insight into how these differences relate to force production.

**Keywords:** kinematics, golf, performance

## UGP-26

**Title:** The City of Facebook? Does social media impact the decision-making of municipal government officials: a West Virginia Case Study.

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

As traditional local news declines, Facebook has become a primary platform for communication between municipal governments and residents. This study examines how Facebook influences local governance in West Virginia municipalities. Using a qualitative research design, semi-structured interviews were conducted with sixteen elected councilmembers from nine cities across the state. The interview instrument was informed by agenda-setting theory and explored officials' experiences with social media, public engagement, and decision-making.

Findings indicate that Facebook functions as a modern town square by shaping public discussion and information flow. While Facebook input rarely changed formal votes, it influenced officials' behavior by affecting agenda setting, preparation, and communication strategies. Only three participants reported changing a vote because of Facebook, and the average perceived influence score was low. Officials also noted that Facebook amplifies a vocal minority, intensifying NIMBY-style opposition. Although harassment was common, direct threats were less frequent. Despite these challenges, most participants believed Facebook increases transparency and accountability and expect its influence to continue growing.

Overall, Facebook does not govern municipalities directly but meaningfully shapes the context in which local decisions are made.

**Keywords:** Social Media, Local Government, Agenda Setting

## UGP-27

**Title:** Coalitional Strength as a Predictor of Anger Proneness

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

The recalibrational view of anger suggests that the emotion of anger serves to change the perception of the angry person, an “actor”, in the eyes of another, a “target”. When the actor feels undervalued by a target, they threaten to impose a cost, or withhold a benefit, from the target, thus increasing the value placed on them by the target. Recent studies have suggested that anger proneness occurs in a predictable way based on how entitled the actor feels, as well as on how successful an actor can be in recalibrating the target’s valuation of them. Traits which affect an actor’s success and entitlement, and thereby how costly it is for someone to ignore an actor’s anger, are known as dimensions of interpersonal leverage. Prior work has focused mainly on two dimensions, physical strength and physical attractiveness, finding a reliable association between the two and anger proneness. In the present study, we evaluate the dimension of coalitional strength, which we conceptualize as the ability of an individual to draw upon the skills and power of allies, as a predictor of anger proneness. In a sample of approximately 150 undergraduates, we use survey measures of anger proneness, entitlement, and coalitional strength to test for a link. We hypothesize that individuals with groups of allies which are close-knit, more powerful (physically and otherwise), and those with a greater number of allies, will be more prone to anger. We will report zero-order correlations between anger proneness and various measures of coalitional strength, as well as regression coefficients for the linear association of coalitional strength with anger proneness, controlling for strength and attractiveness. This study will therefore provide evidence, should it exist, validating the dimension of coalitional strength as a predictor of anger proneness.

**Keywords:** coalitional strength, anger proneness, entitlement, recalibrational theory

## UGP-28

**Title:** Wealth and Resources as Predictors to Anger Proneness

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**Research Sponsors:** Not Applicable

### Abstract

The recalibrational theory of anger posits that anger acts as a social bargaining tool employed to garner better treatment from the individual the anger is directed at. In this regard, anger works by the threat of physical harm or the withdraw of benefits to achieve a higher valuation from target to actor (angered person.) By extending this logic, it is theorized that those individuals with higher interpersonal leverage, which is possession of coveted traits that increase bargaining power, will be more prone to anger, as their threats are more credible, and anger more effective. The prior literature highlights and finds empirical support for two ancestrally valid dimensions of leverage - physical strength and attractiveness - yet leaves gaps in additional potentially valid indicators. Therefore, we theorize having a high level of access to resources/ wealth predicts anger proneness. Using an anonymous Qualtrics survey sent to MU students, scales of anger proneness and entitlement (items randomized) and scales of interpersonal leverage (coalitional strength, resources, status, physical attractiveness, and physical strength; order randomized by participant) are administered. Two attention checks, and a demographic check (age, gender), are included in the study, and answers of participants under the age of 18 will be excluded from the study. We report zero order correlations for multiple wealth measures and anger proneness, and test whether wealth predicts anger proneness after controlling for physical strength and attractiveness. We end by discussing the implications and directions to future research in this field.

**Keywords:** recalibrational theory, anger proneness, interpersonal leverage, predictors of anger, social bargaining

## UGP-29

**Title:** Buried Histories: An Analysis of Death Records from Huntington's Historic Black Cemetery

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**Research Sponsors:** Not Applicable

### **Abstract**

Bethel Memorial Park is a historic cemetery that served as Huntington's black cemetery from the 1920s-1970s. This is the resting place for prominent Black individuals from Huntington, such as veterans and business owners, however many of the graves there are unmarked or have deteriorating markers. This project sets out to examine the cemetery's history and the people interred there through documentary research and a surface survey of the site. Data was gathered using archived collections from the West Virginia Culture Center and Morrow Library Special Collections at Marshall University, which includes vital records and city directories. Records were analyzed to characterize the demographic makeup within the cemetery, including sex, age, date of birth and death, occupation, addresses, and cause of death. The genealogical research website Find a Grave was used to create a database of individuals within the cemetery. A surface survey of the cemetery was conducted to record information on existing headstones' style, location, and condition, as well as to trace the cemetery's condition as it has aged throughout time. This project has two main goals: The first is to highlight a marginalized community and ensure that those interred there are not forgotten; the second is to bring public attention to the cemetery and promote its upkeep and restoration in the future. Archaeological cemetery research is important because cemeteries are sources of community history, preserve heritage, and provide individuals with a sense of identity through knowing their past.

**Keywords:** Archaeology, history, cemetery, Black history, Huntington history

## UGP-30

**Title:** Social Standing as a Predictor of Anger Proneness

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**Research Sponsors:** Not Applicable

### **Abstract**

According to the Recalibrational Theory of Anger, the function of anger is to encourage a target to focus more on the angry individual's welfare. The angry individual threatens to impose costs or withhold benefits, forcing the target to "recalibrate" their welfare tradeoff ratio, a psychological variable representing how much someone values another person's welfare relative to their own. The theory further suggests that individuals with more interpersonal leverage will make more credible threats and expect better treatment, and thus be more prone to anger. Supporting this framework, Sell, Tooby, and Cosmides (2009) found that two dimensions of interpersonal leverage—physical strength and physical attractiveness—predict greater anger proneness, but do so differently between sexes: strength is a stronger predictor for men, and attractiveness for women. However, research beyond this is limited, and a recent replication failed to find the predicted gender differences. Studies have yet to examine forms of social leverage beyond strength and attractiveness. The current study extends this logic to investigate whether subjective social status, defined as perceived relative standing in a hierarchy, similarly predicts anger proneness. We conduct a correlational study with undergraduate students at Marshall University. Students are invited to a Qualtrics survey investigating their opinions on social emotions. The survey will first assess anger proneness and entitlement, with the items presented in randomized order, followed by measures of various dimensions of social leverage, including status, attractiveness, and strength. Status is assessed using the society and community versions of the MacArthur Scale of Subjective Social Status. Participants will also complete a demographic questionnaire, including age and gender. We will report zero-order correlations between subjective social status and anger proneness, as well as partial associations controlling for physical strength and physical attractiveness. Based on the recalibrational framework, we predict that higher subjective social status will be positively associated with anger proneness, and we explore the possibility of gender differences in the association.

**Keywords:** status, anger, leverage

## UGP-31

**Title:** Benchmarks for the Effect of Religious Priming on Prosocial Behavior

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**Research Sponsors:** Templeton Religious Trust

### Abstract

Prosocial behavior, defined as intentional actions that benefit others, is the focus of considerable scientific research, with much recent work investigating religion as a potential cause. Experiments testing the causal impact of religion often operationalize religion by using priming methods adopted from social psychology. Religious priming studies engage participants in conscious or unconscious religious cognition, typically through unscrambling sentences or through a series of flashing words. An early synthesis of such studies found evidence for a significant effect of religious priming on prosocial behavior, particularly among religious individuals. Since that synthesis, however, there have been well over 100 additional studies published examining this claim, with much heterogeneity observed between studies. To fill the need for a quantitative synthesis of the current evidence, a new meta-analysis is underway. However, to get an adequate understanding of an estimated summary effect size, it is necessary to have relevant benchmarks. Benchmarks are standards by which effect sizes can be properly understood in light of their full context. In this research, we review the social psychological literature and identify four relevant benchmarks for the effect of religious priming on prosocial behavior: physical synchrony, reputation, reciprocity, and subtle watching cues. We then search the literature for meta-analyses and quantitative syntheses that address each benchmark, and extract summary effect sizes for the benchmarks, using the metric of Cohen's  $d$ , with accompanying 95% confidence intervals. Where necessary, we conduct and report our own umbrella meta-analyses to compute summary effect sizes. Finally, we evaluate meta-analytic estimates of the effect of religious priming in light of our newly obtained benchmarks. Our findings provide researchers with a more nuanced understanding of the effect of religious cognition on prosocial behavior, and how it compares to other methods of increasing prosocial behavior.

**Keywords:** prosocial behavior, religious priming, meta-analysis, benchmarks

## UGP-32

**Title:** Life, Love, and Trauma: Examining the association among ACEs, emotional intelligence, and relationship satisfaction.

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**Research Sponsors:** Not Applicable

### **Abstract**

This study aims to further our understanding of associations among adverse childhood experiences (ACEs), emotional intelligence, relationship satisfaction/quality, and life satisfaction. The results of existing literature demonstrate negative correlations of ACEs with life satisfaction, relationship satisfaction/quality, and emotional intelligence. Our study seeks to examine the combination and nuance of these relationships, while also addressing other factors, such as the Big Five Personality Traits (Neuroticism, Extroversion, Openness, Conscientiousness, and Agreeableness). To accomplish this, we have developed an online questionnaire that includes measures related to these and other psychological and demographic factors. We are recruiting participants (with a goal of at least 150) with the help of psychology professors by requesting their students to take the questionnaire. We will then analyze the collected data to answer our research questions. For example, in our analyses, we will test the hypothesis that when emotional intelligence and neuroticism are accounted for, ACEs predict lower life satisfaction and relationship satisfaction/quality. As a possible explanation of these associations, we further hypothesize that ACEs predict lower emotional intelligence, which is then negatively associated with life satisfaction and relationship satisfaction/quality. This study will be an important contribution to furthering the knowledge of the complex relationships among ACEs, emotional intelligence, relationship satisfaction, and life satisfaction.

**Keywords:** Relationships, ACEs, Emotional Intelligence, Personality

## UGP-33

**Title:** Impacts of Parenting Styles on Social Anxiety in Appalachia

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**Research Sponsors:** Not Applicable

### **Abstract**

This study assessed the relationship between both maternal and paternal parenting style and social anxiety among adults in Appalachia. While previous research has indicated a relationship between parenting style and offspring social anxiety (Mishra & Kiran, 2018) (Yousaf, 2015) (Alhazmi, 2024), findings are unclear regarding which parenting styles in particular are associated with the development of social anxiety. Additionally, existing findings are also inconsistent regarding whether maternal or paternal parenting styles are more related to child social anxiety symptoms. There is a lack of research involving paternal parenting styles in general, and while many studies suggest that maternal parenting styles are more related to child anxiety symptoms, other findings indicate that paternal parenting styles have a stronger relation to offspring anxiety (Garcia et al., 2021). There is also a lack of research on social anxiety in the Appalachian and rural regions. To address these gaps in the literature, this study explored how both maternal and paternal parenting styles may be related to the development of offspring social anxiety in residents of Appalachia. Data was collected from a sample of 103 participants, who were assessed via an anonymous survey with both a parental authority questionnaire and a social anxiety scale. All participants were raised by both a mother and a father, in order to assess if maternal or paternal parenting styles were more significantly related to child social anxiety symptoms. Based on preliminary results, our study revealed that a maternal authoritative parenting style may have a significant negative relation to the development of offspring social anxiety symptoms. Preliminary analyses also indicated that a maternal authoritarian parenting style may have a significant positive relation to avoidance behaviors, but further analyses may reveal more connections. The final, complete analyses from this study will outline the implications of these findings surrounding the relationship between parenting style and social anxiety, as well as the difference between how maternal and paternal parenting styles may be related to offspring social anxiety.

**Keywords:** Parenting style; social anxiety

## UGP-34

**Title:** Growth Mindsets in Management: A Review on Current Literature

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**Research Sponsors:** Not Applicable

### Abstract

Growth mindsets, which are implicit beliefs one has about the malleability vs. fixity of human traits, have been linked over the past several decades to a variety of motivational and performance-related outcomes. Recent research has sought to capitalize on the potential application of these findings by developing and implementing growth mindset interventions (GMI's). Most GMI research has occurred within educational settings, with evidence suggesting that appropriately targeted, well implemented interventions can increase academic outcomes. As such interventions expand, growth mindset research is finding its way into the workplace. In the workplace, these interventions have the capacity to influence beliefs on a plethora of abilities and job expectations. To date, however, little is known about how the causal models underlying intervention effectiveness for academic outcomes may relate to workplace outcomes and settings, and thus it is unclear how best to design and implement mindset interventions for the workplace. To address this gap, we conduct a systematic review of growth mindset research relevant to the workplace. Our review identifies relevant articles from the FT50 (the top 50 journals the Financial Times deems most influential in business related research). Initial searches yielded a total of 181 articles; abstract and title screening, followed by full-text review, ultimately led us to identify 19 qualifying articles. From these articles, we code 60 variables designed to identify frequent study characteristics, common measures of mindset, notable moderators, and often tested mediators of effects. We map these findings onto the predominant causal model used to understand mindset interventions in academic contexts. Our results provide a thorough description of current mindset research as it begins making its way into workplace applications, and provide a foundation for understanding how best to structure such interventions moving forward. Ultimately, these analyses will contribute to an understanding of how growth mindset interventions impact management practices and the workplace.

**Keywords:** Growth Mindset, Workplace, Intervention, and Review

## UGP-35

**Title:** Looking at Correlations Between Emotional Intelligence, Relationship Quality, and Life Satisfaction Among Appalachian College Students.

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

This study seeks to further understand the relationships between emotional intelligence, relationship quality, and related outcomes. Specifically, beyond the notion that many couples who are in a long-term relationship tend to have higher life satisfaction, we seek to examine whether emotional intelligence predicts higher relationship quality, which in turn predicts positive outcomes such as higher life satisfaction and academic performance (GPA). We are currently recruiting participants online, using a questionnaire given to Marshall University students taking Psychology courses with support from their professors. We aim for a target of at least 150 participants of various backgrounds and relationship statuses. In addition to the factors of interest mentioned above, the questions in the questionnaire address key related points, such as Adverse Childhood Experiences (ACEs), and demographic characteristics (e.g., race/ethnicity, gender, sexuality, and socioeconomic status). I plan to address the study objective mentioned earlier by examining the complex relationships among these factors, conducting a series of multiple regressions. Utilizing the results of this study, it is hoped to understand how emotional intelligence is involved in predicting relationship quality, which therefore indirectly predicts academic performance and life satisfaction. This improved knowledge is expected to inform future research aimed at enhancing relationship quality and associated outcomes.

**Keywords:** Emotional Intelligence, Life Satisfaction, Relationship Quality, Attachment

## UGP-36

**Title:** Exploring College Students' Biases in Relation to Personality

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

This study aims to explore college students' attitudes and biases related to multiple social groups (e.g., racial minority groups, women, people with disabilities, and older adults) and explore how these perspectives may be associated with differing personalities. In considering factors linked to students' perspectives and attitudes, I chose to focus on personality traits using the classic OCEAN model (standing for: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Existing research suggests that traits such as low agreeableness may serve as predictors of stronger underlying prejudicial attitudes. To examine these relationships, we developed an online questionnaire that included measures regarding attitudes and biases related to stereotyped groups, attitudes toward Diversity, Equity, and Inclusion (DEI) initiatives, personality traits, and stress levels. Participants were recruited through a university-wide announcement email and in psychology courses with the assistance of select professors. A total of 388 students completed the survey. Based on prior research and knowledge of the OCEAN model, I hypothesized that low levels of agreeableness and openness to experience will predict more negative attitudes related to underprivileged social groups and DEI initiatives. These relationships were analyzed by examining associations between participants' measured levels of bias and personality trait scores. Findings from this study may contribute to a greater understanding of social biases among college students and help inform future interventions to reduce such attitudes.

**Keywords:** Personality, Biases, DEI, College

## UGP-37

**Title:** Tenant Protections for Domestic Violence Survivors in West Virginia

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**Sponsoring Institutions:** College of Liberal Arts, Political Science

**Research Sponsors:** Not Applicable

### **Abstract**

The lack of statutory protections for renters in private housing who face domestic violence exacerbates the growing homelessness crisis in West Virginia. According to the National Coalition Against Domestic Violence, 39.4% of women and 36.3% of men in West Virginia experience intimate partner violence at some point in their lives. This statistic, combined with housing insecurity faced by many renters, highlights the need for legislation that allows domestic violence survivors to break their lease in privately owned rental properties. Neighboring states have already implemented preventive laws, but West Virginia's laws surrounding the topic are vague and inconsistent, leaving many tenants vulnerable to eviction and potential homelessness. Furthermore, the Bureau for Behavioral Health reports that in 2024, 1 in 6 individuals in the homeless population in West Virginia identified as people fleeing domestic violence. Statistics like this illustrate the urgent need for the state to make significant efforts to protect vulnerable renters from housing instability related to domestic violence.

**Keywords:** Public policy, poverty, housing rights

## UGP-38

**Title:** Attitudes Toward DEI and Their Association with Social Bias Among College Students

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**Sponsoring Institutions:** College of Liberal Arts

**Research Sponsors:** Not Applicable

### **Abstract**

This study explores how attitudes toward Diversity, Equity, and Inclusion (DEI) relate to social bias among college students. As DEI continues to generate divided opinions in public discourse, it is important to examine whether these differing viewpoints are connected to underlying attitudes related to marginalized groups (e.g., racial color blindness, gender bias, perceptions of aging, and ableism). Although prior research has examined intergroup bias, important gaps remain in understanding how perceptions of DEI intersect specifically with social attitudes and biases within the current college generation. The purpose of my study is to examine differences in social biases across students with different attitudes toward DEI while also considering political identity. To investigate these questions, we developed an online questionnaire measuring DEI-related attitudes, political affiliation, and social biases. Participants were recruited through psychology courses and a campus-wide email invitation, and 388 students completed the survey. By addressing these gaps as an effort to extend the existing literature, this study seeks to clarify the relationship between DEI-related attitudes and broader patterns of bias in a college population.[]

**Keywords:** Diversity, Equity, Inclusion, Bias, College

## UGP-39

**Title:** War on the Move: Rural Revitalization One Step at a Time

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**Research Sponsors:** Appalachian Regional Commission

### **Abstract**

The City of War, located in McDowell County, West Virginia, is a small community that faces significant socioeconomic challenges. Classified as 'Distressed' by the Appalachian Regional Commission (ARC, 2024), the region has a poverty rate nearing 40% and health outcomes consistently poorer than the national average. The City of War and McDowell County face challenges, including limited access to healthy food, recreational activities, and healthcare services. Furthermore, the prevalence of diseases of despair, such as cancer, heart disease, and liver disease, is alarmingly high. Senior sociology and anthropology students partnered with the City of War to create an interactive fitness path and walking trail in response to these challenges. This initiative addresses the community's pressing needs, particularly improving access to community spaces that facilitate physical activity and healthy lifestyles. The walking trail, located adjacent to the community garden and the Big Creek Community Center, provides a safe and accessible place to facilitate physical activity for all members of the community, including the placement of benches along the path ensure that older adults and those community members with physical limitations have a recreation area in the community. The fitness path, located along the fenceline within the city park, offers modified exercises on signage so that all members of the community can engage in physical activity at their desired level. The location of both paths near other community areas forms a hub of gathering spaces that encourage socialization and community cohesion.

**Keywords:** Community Activism

## UGP-40

**Title:** The Role of Metabolic Dysfunction on Traumatic Brain Injury (TBI)

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** NASA, Undergraduate Creative Discovery and Research Scholar Award Program

### Abstract

Traumatic Brain Injuries (TBI's) are characterized by an impactful event (i.e. blow to the head) that can cause both acute and chronic dysfunction in the brain. Diagnosis of TBIs can be subjective; however, recent data has pinpointed several secreted proteins as diagnostic factors in the clinical setting, allowing for better identification of trauma and research questions. Unfortunately, there are many questions that remain in regard to susceptibility and recovery in varied conditions included increased adiposity (obesity) and increased inflammation (as seen in type 2 diabetes). Here, we investigated the impact of these factors on TBI severity and recovery using a TBI induction blast model. Mice were subjected to a high fat diet (HFD) to recapitulate obesity and type 2 diabetes. We found that righting reflex times (RRTs) were altered between control and HFD mice in addition to changes in blood glucose dynamics. Lastly, we further evaluated the impact of IL-1B, a marker of inflammation expressed highly in type 2 diabetes, using a loss-of-function approach. Here, we again recorded changes in TBI markers and glucose dynamics. This data in total suggests increased adiposity and inflammation impact TBI recovery and physiological responses.

**Keywords:** TBI, IL-6, adiposity, diabetes, metabolism

## UGP-41

**Title:** Gut Microbial Metabolites of Dietary Tryptophan Stimulate Goblet Cell Differentiation in Human Colonic Organoids

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**Sponsoring Institutions:** Borthakur Lab

**Research Sponsors:** Not Applicable

### Abstract

**Background:** Goblet cells protect the intestinal barrier by secreting mucus that prevents microbial adhesion and invasion. Impaired goblet cell development, as seen in inflammatory bowel disease (IBD) and metabolic syndrome, weakens this barrier. Notch signaling, modulated by the nutrient-sensing mTORC1 pathway, and the transcription factor Kruppel-like factor 4 (KLF4) are key regulators of goblet cell differentiation. While certain bacterial metabolites enhance gut barrier integrity by stimulating goblet cell development, the mechanisms remain unclear.

**Hypothesis:** Gut microbial metabolites derived from dietary tryptophan promote goblet cell differentiation.

**Methods:** Human colonic organoids generated from normal biopsy samples were exposed to indole (0.1–2.0 mM), a major bacterial tryptophan metabolite, or to culture supernatants of *Lactobacillus acidophilus* (LA) grown with or without 5 mM tryptophan. Goblet cell markers were assessed by MUC2 mRNA expression, while KLF4 and mTORC1 activity (phospho-S6) were analyzed by Western blotting.

**Results:** Indole increased MUC2 and KLF4 expression in a dose-dependent manner, peaking at 0.2 mM. Similarly, LA supernatant enhanced MUC2 levels, with greater effects when LA was cultured in tryptophan-enriched medium. Tryptophan-fed LA supernatant also reduced phospho-S6 levels, indicating mTORC1 inhibition and downregulation of Notch signaling.

**Conclusions:** Gut bacterial tryptophan metabolites promote goblet cell maturation by enhancing KLF4 expression and attenuating mTORC1-mediated Notch signaling. These findings reveal a novel mechanism by which the gut microbiota strengthens the intestinal barrier and may define therapeutic strategies for gut disorders such as IBD.

**Keywords:** Gut microbiota Tryptophan metabolism Goblet cell differentiation mTORC1–Notch signaling Human colonic organoids

## UGP-42

**Title:** Regional and Obesity-Associated Variations in Intestinal Insulin Receptor Expression

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**Sponsoring Institutions:** Borthakur Lab

**Research Sponsors:** Not Applicable

### Abstract

Background: Insulin regulates systemic glucose homeostasis primarily by activating insulin receptors (IR) in metabolic tissues such as the liver and skeletal muscle. Although IR is also abundantly expressed in intestinal epithelial cells, its physiological role remains poorly defined. Elevated circulating insulin levels in obesity have been linked to various metabolic complications, yet the specific contributions of intestinal IR to these outcomes is not well understood. Therefore, it is important to determine IR expression along the length of the intestine and its alterations in obesity. Hypothesis: Altered intestinal IR expression is associated with metabolic complications of obesity. Aims & Methods: The regional pattern of IR expression along the normal intestinal tract and alterations in obesity were determined. IR mRNA and protein levels were quantified using real-time quantitative RT-PCR and Western blot in normal rats (Sprague Dawley), as well as in obese Zucker rats and diet-induced obese (DIO) rats maintained on a high-fat diet for 18 weeks. Results: Under normal conditions, IR expression was significantly higher in the large intestine than in the small intestine. Both obese animal models demonstrated marked increases in IR mRNA and protein levels compared with lean or chow-fed controls. In vitro, insulin treatment elevated IR in intestinal cell lines. Conclusions: Intestinal IR expression increases progressively along the intestinal axis, from proximal to distal, reaching its highest levels in the large intestine, with further upregulation under obese conditions. The observed enhancement of intestinal IR in obesity could be linked to obesity-related hyperinsulinemia and metabolic complications.

**Keywords:** 1. Intestinal insulin receptor (IR) expression 2. Obesity-associated hyperinsulinemia 3. Gut–metabolic signaling 4. Regional intestinal physiology 5. Metabolic complications of obesity

## UGP-43

**Title:** Predictors of Prolonged Emergency Department Length of Stay Among Adult Psychiatric Patients in Rural Appalachia

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**Research Sponsors:** Not Applicable

### Abstract

**Introduction:** In rural Appalachia, the emergency department (ED) is a vital access point for acute psychiatric care. Efficient transitions to specialized centers are essential, yet factors prolonging ED length of stay (LOS) remain unclear. Understanding these factors is critical for reducing overcrowding and improving care pathways.

**Purpose:** To identify variables associated with prolonged ED LOS among adult psychiatric patients in a rural Appalachian hospital system. We hypothesized that chief complaint, imaging, medication administration, gender, and disposition would significantly affect LOS.

**Methods:** This retrospective study included adults presenting to Marshall Health Network EDs from January 2020–January 2025. Data included demographics, clinical features, and disposition. ED LOS was defined as time from arrival to discharge. Analysis was conducted using Python.

**Results:** Male patients had longer average LOS than females (259 vs. 236 minutes;  $p = 0.0197$ ). Imaging increased LOS (333 vs. 236 minutes;  $p < 0.0001$ ). Abnormal labs were linked to longer stays (309 vs. 176 minutes;  $p < 0.0001$ ). Admission or transfer led to longer LOS (445 vs. 242 minutes;  $p = 0.000047$ ). Patients receiving psychiatric medications had the longest stays (472.8 minutes), followed by non-psychiatric medications (388.5 minutes), with no-medication patients having the shortest LOS ( $p < 0.0001$ ). Psychotic disorders (332 minutes) and substance-related disorders (266 minutes) were associated with longer stays than other behavioral diagnoses ( $p < 0.0001$ ).

**Conclusion:** Chief complaint, imaging, lab abnormalities, and disposition significantly affect ED LOS for psychiatric patients in rural Appalachia. These findings can guide interventions to improve patient flow and reduce delays in psychiatric care delivery.

**Keywords:** Rural Health, Appalachia, Length of Stay

## UGP-44

**Title:** Neuroinflammatory and Oxidative Stress Responses to High-Fat diets, Ethanol Consumption, and Phytol

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** Not Applicable

### Abstract

Chronic high-fat diet (HFD) and ethanol intake are known to promote systemic oxidative stress and neuroinflammatory signaling. Phytol, a naturally occurring component of the chlorophyll molecule, was included for its potential antioxidant and anti-inflammatory properties. Male and female wild-type mice, 10 weeks of age, were assigned to one of four diets: normal chow (NC), high-fat diet (HFD), high-fat diet + ethanol (HFD+E), and high-fat diet + ethanol + phytol (HFD+E+P). Western blot analyses of NOX2, NOX4, and phosphorylated p65 showed increased expression in HFD+E+P compared to HFD and HFD+E groups while analyses of IL-6 and catalase showed decreased expression in phytol groups. RT-PCR analysis of TNF- $\alpha$ , IL-6, IL-1 $\beta$ , and mRNA expression, normalized to U6, showed a decrease in the inflammatory markers TNF- $\alpha$  and IL-6 in HFD feeding along with a slightly elevated IL-1 $\beta$ . Addition of ethanol further decreased expression of these markers, while phytol partially restored cytokine and catalase expression toward NC levels. Taken together, these results indicate that chronic HFD and ethanol exposure produced a non-canonical neuroinflammatory profile, with discrepancies between the oxidative and inflammatory pathways at the protein and transcriptional levels. The phytol groups showed varied responses across inflammatory and oxidative markers, with some expression changes trending toward NC levels. Overall, these findings suggest that phytol has the potential to alter neuroinflammation and oxidative stress induced by HFD and ethanol. Future work should investigate the molecular mechanisms through which phytol modulates inflammatory and oxidative pathways.

**Keywords:** Neuroinflammation, Oxidative Stress, High-fat Diets, Ethanol Consumption

## UGP-45

**Title:** Self-Organized Metasurface Enabling Negative Photoconductance and Memristive Behavior via van der Waals Interaction

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**Research Sponsors:** 2023-2027 WV HEPC Research Challenge Grant #23-007, 2025 NASA WV Space Grant Consortium Training Grant #80NSSC25M7079, NSF MRI Grant #2408115

### Abstract

Negative photoconductance (NPC) and memristive behavior have been observed simultaneously in planar, metal-oxide-based heterojunctions. Self-organized TiO<sub>2</sub> crystalline metasurface thin films were prepared by spin-coating with polymer-templated precursors, yielding a smooth, uniform, and full-coverage surface with metastructure features sizing from 1 to 3  $\mu\text{m}$ . After depositing CuO crystalline thin films on a conductive substrate, two metal-oxide thin films are held together face-to-face by mechanical clips to form a heterojunction diode. Due to stacking architecture, van der Waals interactions play a crucial role at the interface. The IV characteristics of the pn heterojunctions exhibit pronounced rectification and NPC, with the current dropping by a factor of 6 as the temperature increases by 20 °C under white-light irradiation. The NPC can be attributed to increased charge-carrier recombination and lattice vibrations induced by infrared light absorption, leading to a temperature rise. The cyclic IV curves exhibit a narrow hysteresis, a characteristic of a memory-type resistor during voltage sweeping. The mechanism underlying memristive traits has been qualitatively hypothesized using a circuit model based on series and parallel connections of resistors and capacitors, reflecting the metastructure at the interface. The fabricated memdiodes may serve as alternative electronic elements for integration into photo-memory-type computing hardware.

**Keywords:** self-organized metasurface, memristive diode, heterojunctions, van der Waals interactions, metal-oxide thin films

## UGP-46

**Title:** From Diagnostics to Dangerous: The Danger of Arbitrary CAN Control in Remote Vehicle Telematics Systems

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**Research Sponsors:** Institute for Cyber Security

### **Abstract**

The rising interconnectivity of the modern world creates a market for internet-controlled vehicle systems capable of sending commands directly to a vehicle's CAN bus interface- the network used to control most modern vehicle electronics. These systems, regardless of status as aftermarket or factory original, can enable functionality such as remote diagnostics, GPS-based tracking, telemetry, as well as other remote controls, at any distance provided both sides have an internet connection. Our research highlights the importance of strong authentication on remote CAN bus control by demonstrating the extent of control these systems possess. Without the access for proper auditing of these systems, it is possible the attacks demonstrated are actively being used against modern vehicles.

**Keywords:** Cybersecurity, Automotive, Telematics, CANBUS, IOT

## UGP-47

**Title:** Identifying neurons and neural activation following odor stimulation of *Rhagoletis pomonella* fruit flies

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**Research Sponsors:** The lab received support from NSF award #OIA-2242771

### Abstract

Understanding how fruit flies process olfactory sensory information is key to understanding how to combat the adverse effects they have on fruits including apples, junipers, walnuts, and more. Fruit flies like *Rhagoletis pomonella* use specific olfactory circuits traveling from their antennae to their brain to find appropriate host fruits to reproduce and lay eggs. For this study, it was our goal to validate fluorescent in-situ hybridization chain reaction as a way to mark neuron types and neural activation via gene expression in the brain of these pest flies. First, the flies were exposed to 10 minutes of direct olfactory stimulation using volatiles found within natural host fruits of the species, then flies were immediately euthanized. After fixing using paraformaldehyde and dissecting the brains, we targeted the immediate early gene (IEG) stripe (*EGR-1*) to mark neural activity present after olfactory stimulation. Simultaneously, we labeled for expression of tryptophan hydroxylase (*TrHy*). *TrHy* is the rate-determining enzyme that produces serotonin in insects, including *Rhagoletis*. We were interested in determining if there was a notable difference in *TrHy* expression between male and female *Rhagoletis* flies, and between different *Rhagoletis* species. Additionally, as *TrHy* is a well characterized gene across the tree of life, and serotonergic neurons have been mapped in the brains of *Drosophila melanogaster*, we can make comparisons between these species and expect to have meaningful results. Our experiments to identify *TrHy*-positive, serotonergic neuron clusters in the *Rhagoletis* brain, as well as all the neurons activated by different odor stimuli, are continuing and our results will be presented at the symposium.

**Keywords:** In-situ hybridization, Olfaction, Tryptophan hydroxylase, Neurons, Immediate early genes

## UGP-48

**Title:** Making Neutron Star Merger Simulations Ready for Next-Generation Gravitational-Wave Detectors

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**Research Sponsors:** NSF

### Abstract

Gravitational waves from merging neutron stars allow scientists to probe matter at extreme densities. To interpret these signals, future detectors will require highly accurate theoretical waveforms generated through large-scale computer simulations in Numerical Relativity. However, the raw output of these simulations cannot be used directly. Numerical artifacts and resolution effects can introduce errors that hide real physical information.

In this project, we developed a two-step process to prepare simulation data and transform it into analysis-ready gravitational waveforms for scientific use. First, we cleaned the data by removing nonphysical features such as “junk” radiation produced at the start of simulations, correcting unit inconsistencies, reducing orbital eccentricity, and identifying the contact time separating the smooth inspiral phase from the more complex merger phase. Second, we studied how numerical resolution affects the results by comparing simulations at multiple numerical resolutions. We applied Richardson extrapolation to estimate the continuum (infinite-resolution) waveform and quantify numerical uncertainty.

Through this work, we gained experience in computational physics, numerical error analysis, and gravitational-wave modeling. Our results help ensure that differences seen in simulations reflect real neutron star physics effects rather than computational error, improving confidence in gravitational-wave predictions.

**Keywords:** Gravitational waves, merging neutron stars, computational techniques

## UGP-49

**Title:** Silver Nanoparticle Exposure May Induce Synaptic Neurodegeneration in Rat Neocortex

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**Research Sponsors:** NSF

### Abstract

Silver nanoparticles (AgNPs) are manufactured silver measuring 1-100nm in diameter and are used as an antimicrobial agent in consumer products such as cosmetics, toothbrushes, clothing items, and other common products. During manufacturing and use of these consumer products, AgNPs are shed into the environment, including water sources, exposing the public to these particles. Due to their unique chemical and physical properties, AgNPs can pass through the blood brain barrier and accumulate in neural tissue. AgNPs have been shown to induce oxidative stress and Tau phosphorylation in memory-associated brain regions such as the neocortex. It remains unclear whether AgNP exposure alters the localization PSD-95 and phosphorylated Tau (p-Tau). Colocalization of these proteins would be an indicator of synaptic dysfunction induced by AgNPs. This study investigated whether AgNP exposure alters the location of PSD-95 and p-Tau in the neocortex. Twelve rats were divided into immediate and recovery groups with control, low-dose (25 mg/kg/day), and high-dose (100 mg/kg/day) treatments. The immediate group was collected directly after treatment and the recovery group was collected 30 days after treatment to examine the effects of bioaccumulated AgNPs. Brain sections were labeled with immunohistochemistry for PSD-95 and p-Tau. Colocalizations were quantified using confocal microscopy and Fiji image analysis with SynBot. Preliminary data suggest that a dose-dependent increase in colocalization of PSD-95 in both males and females. These findings suggest that AgNP exposure may affect synaptic integrity highlighting the importance of how AgNPs affect the brain.

**Keywords:** p-Tau, PSD-95, and Environmental Contaminant

## UGP-50

**Title:** Identification of pyrolysis products of 3-chloro-3-methylpentane using matrix-isolation FTIR

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**Research Sponsors:** Daniel P. Babb Trust, MU Chemistry Summer Undergraduate Research Fellowship (SURF), MU Chemistry SURE Research Fellowship, and the donors of the American Chemical Society Petroleum Research Fund, for funding this research.

### Abstract

Chlorinated hydrocarbons like 3-chloro-3-methylpentane are common byproducts of the pyrolysis of polyvinyl chloride (PVC). As plastic production increases, chemical recycling techniques like pyrolysis, heating without exposure to oxygen, are increasingly used in an effort to reduce waste. 3-chloro-3-methylpentane has been identified as a pyrolysis product of PVC. Understanding the mechanisms these compounds undergo during thermal degradation could lead to the ability to predict products of thermal decomposition based on an initial compound which could allow for the innovation of recycling techniques. In this research, the thermal decomposition of 3-chloro-3-methylpentane was observed using gas phase pyrolysis and matrix-isolation Fourier transform infrared spectroscopy. The matrix mixture containing the sample and argon at a ratio of 1:250 was expanded from a pulsed valve into a heated silicon carbide tube where pyrolysis occurred at temperatures up to 1400 K. The pyrolysis products were then sprayed onto a cold cesium iodide window where the matrix mixture was frozen and FTIR spectroscopy was performed. The thermal decomposition products were identified through the obtained infrared spectra. The following thermal decomposition products of 3-chloro-3-methylpentane were identified: vinylacetylene, vinyl chloride, allyl, allene, propargyl, propyne, propane, acetylene, HCl ethylene, ethane, and more. Geometry optimization and frequency calculations were performed for possible transition states and products for unimolecular dissociation pathways of 3-chloro-3-methylpentane. A comparison of the computational and experimental results provides clues to the mechanisms of thermal decomposition.

**Keywords:** Pyrolysis, Chlorinated Hydrocarbons, PVC Recycling, FTIR,

## UGP-51

**Title:** Effect of Electron-donating Groups on 1,4-Dichlorobenzene Nephrotoxicity in Vitro.

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**Research Sponsors:** NIH

### Abstract

Chlorinated aromatic compounds are common environmental and industrial chemicals with variable nephrotoxic potential influenced by their substituent groups. This study investigated the nephrotoxicity of three chlorinated compounds: 1,2,4-trichlorobenzene (1,2,4-TCB), 2,5-dichlorophenol (2,5-DCP), and 2,5-dichloroanisole (2,5-DCA), focusing on the role of electron-donating substituents on their nephrotoxic potential. Isolated kidney cells (IKCs) (approximately 4 million cells/mL; 3mL) from male Fischer 344 rats were exposed to dimethyl sulfoxide (DMSO) or 0.25, 0.5, or 1.0 mM of each compound, for 30 or 60 minutes at 37 °C with shaking under oxygenated conditions. Cytotoxicity was determined by measuring lactate dehydrogenase (LDH) release. Among the compounds tested, the decreasing order of nephrotoxicity was 2,5-DCP > 1,2,4-TCB > 2,5-DCA. This conclusion was based on the time and concentration cytotoxicity induced by the three compounds. These compounds are all derivatives of 1,4-dichlorobenzene (1,4-DCB), and the hydrogen atom at the 2 -position results in a compound that is more nephrotoxic than the 2,5-DCA, yet less toxic than 2,5-DCP and 1,2,4-TCB. This trend highlights how the type and position of substituent groups can influence cytotoxicity. These findings suggest that, in general, electron-donating groups may enhance nephrotoxicity, possibly by facilitating metabolic activation or formation of reactive intermediates with the exception being the methoxy group, which reduced cytotoxicity.

(Supported by NIH Grant: P20GM103434)

**Keywords:** Electron-donating, Nephrotoxicity, in Vitro, Chlorinated aromatic compounds, Dichlorobenzene

## UGP-52

**Title:** Pyrolysis and Matrix Isolation of 2-chloro-2-methylpentane

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** Daniel P. Babb Trust, Donors of the American Chemical Society Petroleum Research Fund, NASA Space Grant Fellowship

### Abstract

A chlorinated hydrocarbon that has been observed during the pyrolysis and chemical recycling of PVC is 2-chloro-2-methylpentane. Understanding which HCl elimination pathway 2-chloro-2-methylpentane undergoes, and what products are produced during its pyrolysis, will aid in the chemical recycling of PVC plastics. Chlorinated hydrocarbons have little commercial use and are typically toxic. By understanding the mechanism scientists can devise ways to manage unwanted chlorinated hydrocarbons. The goal of this project was to determine the products of 2-chloro-2-methylpentane's pyrolysis products using matrix isolation and FTIR spectroscopy. Matrix isolation is a technique in which a mixture of the molecule is mixed with argon. The molecule was mixed in a ratio of 1:250. This mixture was pushed through a pulsed valve where it entered a silicon carbide tube which was heated to 1400 K. The mixture was sprayed onto a 4 K CsI window, and an FT-IR spectrum was collected. The benefit of using matrix isolation as a technique is that the argon forms a matrix around the target molecule "locking" it in place preventing side reactions from occurring. This process was performed for 2-chloro-2-methylpentane, 2-methyl-1-pentene, and 2-methyl-2-pentene. These two pentenes were chosen to determine the mechanism for the HCl elimination. A comparison of spectra indicated that 2-methyl-1-pentene is the primary pentene formed from the HCl elimination pathway. Further analysis of spectra indicated that 2-methyl-2-pentene was forming but broke down in the silicon carbide tube into smaller hydrocarbons. Pyrolysis products that have been identified are ethylene, allyl chloride, propene, allene, propyne, HCl, vinylacetylene, 2-methyl-1-pentene, and 2-methyl-2-pentene.

**Keywords:** FTIR, pyrolysis, matrix isolation, chlorinated hydrocarbons

## UGP-53

**Title:** The Influence of Tributary Inflow on Nutrient and Periphyton Abundance in Fourpole Creek, WV

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**Research Sponsors:** Fourpole Creek Watershed Association

### **Abstract**

Periphyton represents a community of microscopic to macroscopic aquatic organisms that grow on the substrate of aquatic ecosystems. Within the periphyton community are benthic algae and cyanobacteria, which serve as important primary producers and major food sources for aquatic organisms. However, when excess nutrients are introduced into these aquatic ecosystems, algae and cyanobacteria can rapidly grow out of control, resulting in blooms. Such blooms can pose risks to the health of both the aquatic ecosystem and humans by causing oxygen sags and releasing harmful toxins. Large periphyton mats, characteristics of a bloom, have been observed in Fourpole Creek, WV, an understudied tributary of the Ohio River, making it an area of interest. This study aims to better understand the role of tributaries in supplying nutrients to the mainstem of Fourpole Creek, and how periphyton abundance fluctuates in response to nutrient conditions. Four sites were placed above and below two of the three major tributaries into Fourpole Creek. Physical water quality samples and phytobenthic concentrations were obtained weekly when able. 12 Nutrient and periphyton sampling occasions were planned, with four events each representing low flow, base flow, and high flow conditions. Phytobenthic abundance and chlorophyll concentrations were evaluated with respect to nutrients and water quality parameters.

**Keywords:** Nutrients, Algae, Aquatics, Lotic, Freshwater

## UGP-55

**Title:** Construction of amphiphilic dendrimers through chirality-directed self-assembly: Application towards recyclable homogeneous catalysis

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**Research Sponsors:** National Science Foundation

### Abstract

Amphiphilic dendrimers are highly branched polymers with both hydrophilic and hydrophobic domains. Their tunable structure and functional adaptability make amphiphilic dendrimers promising nanomaterials, thereby enhancing versatility in various nanotechnology and materials science applications. Current methodologies for constructing amphiphilic dendrimers primarily utilize covalent bonds to connect hydrophilic and hydrophobic domains. This often leads to difficulty in scalability, functional group compatibility in reaction conditions, and increased labor in preparing a larger library. Additionally, the irreversibility of covalent bonds significantly impacts the recyclability of dendron subunits.

To address these issues, chiral ligand/metal self-assembly was employed to generate an extensive library of amphiphilic dendrimers. Treatment of an equimolar mixture of enantiomeric chiral ligand with zinc (II) ion affords exclusive formation of the heterochiral Zn(II) complex through chiral self-discrimination. By attaching hydrophilic and hydrophobic functional groups to each chiral ligand, diverse amphiphilic dendrimers were prepared in situ in a short period of time. Moreover, the resulting Zn(II) BOX complexes at the focal point, unlike non-covalent bonds, are highly stable and stay intact at elevated temperatures, yet can be reversibly disintegrated under mild conditions using EDTA. This approach can be easily applied to generate multi-functionalized amphiphilic dendrimers, which led to the one-pot generation of various functionalized nanostructured colloidal systems.

**Keywords:** dendrimer, catalysis, self-assembly

## UGP-56

**Title:** Forest understory compositional changes of Great Smoky Mountains National Park (1999-2025)

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**Research Sponsors:** Not Applicable

### Abstract

Forests in Eastern North America are changing as a result of land-use history, disturbances, and climate change. Great Smoky Mountains National Park (GSMNP) is an ideal setting for studying ecological changes in forest structure due to high biodiversity and a broad elevational gradient. We resampled long-term monitoring plots known as All-Taxa Biodiversity Inventory (ATBI) plots using the Carolina Vegetation Survey (CVS) protocol to examine how forest structure has changed and how plant communities have shifted over the last 25 years. Specifically, we examined how understory plant communities have responded to canopy structure change as a result of pests, disturbance, and ongoing environmental change. I hypothesized that high-elevation forests would experience greater compositional change than low-elevation forests historically dominated by early successional species. Between 1999 and 2000, 0.1 hectare CVS plots were established across 11 community types in GSMNP. In summers 2024 and 2025, we resampled 20 ATBI plots spanning 8 forested community types, estimating cover for all vascular plant species. Using NMDS ordination based on Bray-Curtis dissimilarities, we visualized temporal changes in the understory plant communities and compared this with an analysis of overstory composition. We found that understory vegetation exhibited greater compositional change than the overstory, especially in high-elevation forests. The results supported the hypothesis, likely due to higher stress in high-elevation communities from pests like the balsam wooly adelgid (*Adelges piceae*). Early successional species such as *Liriodendron tulipifera* are abundant at low elevations, and better at surviving in high- light gaps and withstanding environmental changes. It is important to include these analyses in forest change studies due to the impact on community biodiversity, ecological processes, and nutrient cycles that forest understories have. Long-term resurveys provide important information about the interacting effects of disturbance, land-use history, and climate change for well informed land management decisions in the future.

**Keywords:** biodiversity, plant ecology, disturbance, understory, plant communities

## UGP-57

**Title:** Thymidine Phosphorylase Deficiency Attenuates Western Diet-Induced Body Weight Gain in Mice

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**Sponsoring Institutions:** College of Science, Honors College

**Research Sponsors:** NASA

### Abstract

Obesity is an independent risk factor for multiple metabolic disorders, including metabolic dysfunction-associated steatotic liver disease, cardiovascular disease, and type II diabetes. West Virginia has the highest obesity prevalence in the United States. Although GLP-1 agonists effectively reduce body weight, their use has been linked to increased risks of thrombosis and fetal growth restriction. Therefore, developing novel mechanism-based anti-obesity therapies remains a priority. Through analysis of the GEO database, our laboratory identified thymidine phosphorylase (TYMP) as significantly upregulated in obese individuals. We previously showed TYMP deficiency or inhibition attenuates thrombosis; however, its role in obesity is unknown. Using RT-PCR, I profiled TYMP expression across mouse tissues and found the liver exhibiting the highest expression among metabolic organs. Our lab recently generated a new Tymp knockout mouse strain (Tymp<sup>-/-</sup>#2), which lacks detectable TYMP mRNA. To assess the metabolic consequences of TYMP deficiency, wild-type (WT) and Tymp<sup>-/-</sup>#2 mice were fed a Western diet (WD) beginning at 8 weeks of age for 8 weeks. WD-induced weight gain was significantly reduced in male, but not female, TYMP-deficient mice. Liver and perigonadal fat weights were also markedly decreased, and insulin sensitivity was improved in TYMP-deficient males. These findings align with our previous observations in an independent TYMP-deficient strain (Tymp<sup>-/-</sup>#1), which carries an exon 4 deletion and similarly reduced WD-induced weight gain. Together, our data identify TYMP as a key mediator of diet-induced obesity and support targeted TYMP inhibition as a promising therapeutic strategy.

**Keywords:** TYMP, Obesity

## UGP-58

**Title:** Benchmark Spectra of Chlorinated and Unchlorinated Hydrocarbons in Argon Matrices

**Authors/Presenters:** David Kapp, Andrew Fields, Alexis Bowles, Benjamin Campbell, Justin Gainer

**College/School:** College of Science

**Mentors:** Dr. Laura McCunn

**Sponsoring Institutions:** College of Science

**Research Sponsors:** Not Applicable

### Abstract

The pyrolysis of PVC plastic can yield both chlorinated and unchlorinated hydrocarbons, with matrix-isolation FTIR being a good method to identify the products of said experiments. Unfortunately, some products can be difficult to assign due to a lack of literature spectra for comparison. The goal of this work is to establish reliable benchmark spectra of select chlorinated species and propyne clusters, isolated in argon matrices. These species are suspected to be formed from high-temperature reactions of 2-chlorophenol, formed during PVC pyrolysis. Chloroacetic acid was employed to generate chloroacetylene by pyrolysis so the spectrum of the latter could be recorded. Likewise, propyne can be deposited independently, or via co-deposition, to isolate various clusters, depending on the design of the experiment. Spectra of both heated and unheated samples were recorded in an argon matrix with variations to the argon-sample ratio. Each of these experiments were completed using a pulsed, hyperthermal small tubular reactor for gas-phase samples between 800 K to 1300 K and a matrix-isolation FTIR spectrometer.

**Keywords:** Pyrolysis, PVC, Biofuels

## UGP-59

**Title:** Investigating Sex Differences in Synaptic Pruning by Microglia in the Mouse Visual Cortex

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**Research Sponsors:** NSF, NASA West Virginia Space Grant Consortium

### Abstract

Investigating Sex Differences in Synaptic Pruning by Microglia in the Mouse Visual Cortex Synaptic connectivity is essential to key cognitive functions, such as learning and memory formation. Glial cells are known to greatly impact the formation and maintenance of these connections. Our lab predominantly focuses on astrocytes, an important glial cell that contributes to synaptogenesis and maturation through protein secretion, including thrombospondin (TSP). Previous studies from our lab show the importance of signaling between astrocyte-derived TSP and neuronal receptor  $\alpha 2\delta$ -1 for development of synapses in the mouse visual cortex. This importance differs between sexes, showing a stronger impact in males as opposes to females. Our studies also found interactions between estrogen signaling and TSP/ $\alpha 2\delta$ -1 to regulate synaptic connections. However, astrocytes are not the only glial cell that regulate synaptic connectivity. Another glial cell type, called microglia, possess the ability to repair dysfunctional connectivity by phagocytosing synapses through a process known as synaptic pruning. We therefore hypothesized that the synaptic density differences we previously encountered may be impacted by microglial synaptic pruning. Our current study started with injecting wild-type (WT) and forebrain-specific  $\alpha 2\delta$ -1 knockout (KO) male and female mice with either estradiol (E2), letrozole (an aromatase inhibitor), or saline starting on postnatal day 7 (P7) through P40  $\pm$  2 days, to account for the 4-day estrous cycle. Brain sections were collected and stained using immunohistochemistry for Iba1 (microglial marker), CD68 (lysosomal/phagocytosis marker) and VGluT1 (presynaptic protein). Confocal images from the prefrontal cortex were captured and imported into IMARIS, a program that allows us to generate 3D reconstructions of cellular and subcellular structures. Our imaging is complete and IMARIS reconstructions and analysis are ongoing. We already have significant findings suggesting that estrogen increases lysosomal activity and engulfment of presynaptic puncta in WT males that received estrogen treatment, which indicates that increased microglial pruning is occurring. We hope that future analysis will further reveal the role of microglia in regulating synaptic densities between different sexes.

**Keywords:** Tripartite Synapse, Microglia, Cortical Development, Sex differences, estrogen

## UGP-60

**Title:** Preliminary Clast Lithologies and Lithofacies Analysis of Teays River Deposits at Scary, WV

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** Not Applicable

### Abstract

In Scary, WV an excavation of the Teays Formation recently took place. This area was part of the ancient Teays River drainage basin. This system was occupied by the northwestern flowing Teays River until continental glaciation in the early Pleistocene caused ice damming and ultimately the formation of Lake Tight. At the excavation site, the bedrock floor of the ancient Teays River is directly overlain by sand and gravel deposits arranged in two stacked fining-upwards sequences of coarse gravel to medium sand. Importantly, the very coarse and coarse pebbles in the two sequences differ in clast lithology. In the lower unit, although most clasts are locally derived (94.75%) sandstone and siltstone, exotic (5.25%) metamorphic and igneous clasts along with vein quartz suggest sediment input from the distant Blue Ridge Mountain area. In contrast, the upper unit consisted of 100% locally derived sandstone, siltstone, and minimal amounts of chert. The cause of this variation remains unclear but could be linked to drainage changes in headwater areas and/or the timing of abandonment of the valley by the Teays River. Lithofacies analysis using the Miall codes for fluvial deposits identified the following: Gh facies (longitudinal bars, channel lag), Sp facies (transverse bars, 2-dunes), Sl facies (scour fills, washed-out dunes), and Sr facies (ripple beds). Their vertical arrangement is compatible with a shallow, gravel-bedded, braided river. The uppermost reddish sand beds (Sp & Sr) in both sequences contain black intervals enriched in Mn-oxide which typically indicate periods of intense chemical weathering and reduced sedimentation. The Sr lithofacies is only present in the upper sequence where it is directly overlain by varved lake deposits. It preserves symmetrical ripple marks that record reworking of fluvial sand by shallow-water waves as ice-dammed Lake Tight rose to cover this part of the river valley.

**Keywords:** Teays river, clast lithology

## UGP-61

**Title:** Synthesis of 1,8-dihalonaphthalene and 4,5-dihaloisoquinoline derivatives to be used in a generalized homocoupling reaction

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** NASA

### Abstract

A homocoupling reaction to synthesize perylene from 1,8-dihalonaphthalene was developed. This reaction predicted to be more general and capable of synthesizing many new perylene derivatives that previously required a custom synthesis for each molecule. In order to synthesize more perylene derivatives, the substrate scope is under investigation. This presentation focuses on the synthesis of 1,8-dihalonaphthalene derivatives and 1,8-dihaloisoquinoline derivatives as coupling partners for further investigation of the homocoupling reaction to produce perylene derivatives. These products are characterized by  $^1\text{H}$  and  $^{13}\text{C}$  NMR, IR, mass spectrometry, and UV-Vis absorption. Outcomes of this study allows for novel perylene derivatives to be synthesized for a study of optical and electronic properties.

**Keywords:** Electronics; OLED; Spectroscopy; Characterization; Perylene

## UGP-62

**Title:** TYMP and Insulin Resistance

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**Sponsoring Institutions:** School of Medicine, Department of Biomedical Sciences

**Research Sponsors:** Not Applicable

### Abstract

Insulin resistance (IR) is a major pathogenic driver of multiple metabolic disorders, including obesity, metabolic dysfunction-associated steatotic liver disease (MASLD), cardiovascular disease, and type 2 diabetes. Despite its clinical significance, the molecular mechanisms underlying the development of IR remain incompletely understood. Our laboratory previously identified thymidine phosphorylase (TYMP), a key enzyme in pyrimidine nucleoside metabolism, as significantly upregulated in obesity across multiple species, including mice. Furthermore, we demonstrated that TYMP deficiency or pharmacological inhibition markedly attenuates high-fat diet (HFD)-induced body weight gain. However, whether TYMP contributes directly to the development of IR has not been investigated. HFD feeding induces adaptive remodeling of pancreatic islets as a compensatory response to systemic IR. Excess dietary lipids impair insulin sensitivity in metabolic tissues, including the liver, skeletal muscle, and adipose tissue, thereby increasing the demand for insulin secretion. To maintain glucose homeostasis, pancreatic  $\beta$ -cells undergo hypertrophy and proliferation, leading to expansion of  $\beta$ -cell mass and enlargement of pancreatic islets. Thus, increased islet size is commonly used as a histological indicator of compensatory IR. Based on these observations, we hypothesized that TYMP promotes IR and contributes to obesity- and MASLD-associated metabolic dysfunction. To test this hypothesis, wild-type (WT) and *Tymp*<sup>-/-</sup> mice were fed either a standard chow diet or an HFD for 16 weeks, starting from 8 weeks of age, and body weight was monitored weekly throughout the feeding period. At the end of the study, pancreases were harvested and processed for histological analysis. Pancreatic tissues were sectioned at 6  $\mu$ m thickness and subjected to immunohistochemical staining for insulin to identify pancreatic islets. Islet number and size were quantified from histological sections and used as indicators of IR-associated pancreatic remodeling. The average number of islets per section area was comparable between genotypes and dietary conditions, indicating that TYMP deficiency does not affect islet density. Under chow diet conditions, islet size was similar between WT and *Tymp*<sup>-/-</sup> mice. HFD feeding significantly increased islet size in WT mice compared with chow-fed controls, whereas it did not affect islet size in *Tymp*<sup>-/-</sup> mice. WT mice fed an HFD exhibited markedly larger islets with stronger insulin staining compared with *Tymp*<sup>-/-</sup> mice. In addition, TYMP deficiency significantly attenuated HFD-induced body weight gain. Together, these findings suggest that TYMP plays an important role in promoting IR and metabolic dysfunction under conditions of dietary lipid excess. Targeting TYMP may represent a novel therapeutic strategy for preventing or treating metabolic disorder-associated diseases, including obesity and MASLD.

**Keywords:** Insulin resistance, Thymidine phosphorylase, obesity, MASLD

## UGP-63

**Title:** Evaluation of Tripartite Synapse Maturation using Spatial Transcriptomics

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**Sponsoring Institutions:** College of Science, School of Medicine

**Research Sponsors:** West Virginia Network for Functional Neuroscience and Transcriptomics (WV-NFNT)

### Abstract

Proper synaptic maturation is vital for optimal cognitive function and brain activity. Many of these synapses are ensheathed by a peripheral astrocyte process (PAP) to form the tripartite synapse. Synaptic transmission is regulated through PAP-synaptic crosstalk involving contact-mediated and secreted factors. However, details regarding the development of these tripartite synapses remain understudied. Our previous studies have demonstrated that synaptic maturation follows a unique developmental timeframe depending on the subregion of the brain. Moreover, alcohol exposure during development (Adolescent Intermittent Ethanol Exposure (AIE)) induces a subregion-dependent loss of PAP-synaptic proximity that persists into adulthood. We hypothesize that the varying subregion-specific maturation states of the tripartite synapse predict vulnerability to AIE-induced loss of PAP-synaptic proximity. Our study focuses on assessing changes in mRNA expression of bridging proteins critical to tripartite synapse stabilization. We used formalin-fixed paraffin embedded brain tissue collected from C57BL/6 mice euthanized at three developmental stages: postnatal day (PND) 31 (early adolescence), PND 46 (late adolescence), and PND 72 (adulthood). One 5  $\mu\text{m}$  section was used for spatial transcriptomics (ST), prepared using Visium HD (10x Genomics). SpaceRanger was used to align the samples to the reference genome and for image processing. The R package Seurat was used for downstream data analysis. Visium HD ST data was analyzed using per-sample preprocessing, followed by multi-sample integration. For each 16  $\mu\text{m}$  sample, we loaded the binned matrix, kept tissue-associated bins using the Space Ranger tissue mask, and applied bin-level QC based on UMIs. We then were able to detect genes and mitochondrial fractions. QC-passed samples were then merged, normalized, and variable genes were selected for. Then, sketch-based clustering was used for PCA/UMAP. Cluster labels and embeddings were finally projected back to all bins for visualization and marker discovery. The ongoing data analysis will characterize the PAP-synaptic transcriptomic changes during these timepoints to provide context to future studies on the relationship between AIE induced loss of PAP synaptic proximity and the loss of synapse stabilizing proteins.

**Keywords:** tripartite synapse maturation, spatial transcriptomics

## UGP-64

**Title:** Drone Detection Using 2.4GHz Frequency Monitoring

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**Research Sponsors:** Drone Trace

### Abstract

Law enforcement personnel increasingly recognize consumer-grade Unmanned Aircraft Systems (UAS) as a significant security concern, particularly for agencies responsible for protecting critical infrastructure such as airports, power grids, railways, water systems, and other sensitive facilities. The rapid proliferation of commercially available drones has introduced new challenges for monitoring and responding to unauthorized aerial activity. As a result, law enforcement and security organizations are actively researching reliable methods to detect and identify drones operating beyond visual range. One promising approach involves analyzing the radio frequency (RF) emissions generated by drones during normal operation.

Previous research has demonstrated that drone control and video transmission signals can be detected in the 2.4 GHz and 5.8 GHz bands using wideband Software-Defined Radios (SDR). However, many existing detection solutions rely on expensive hardware platforms or systems that are difficult to deploy in portable or field-ready configurations. Many current detection methods depend on the FAA-mandated Remote ID (DronelD) broadcast frequencies. While Remote ID can provide useful information, it assumes compliance and does not account for devices that disable, spoof, or otherwise avoid broadcasting identification data.

The project focuses on characterizing the RF signature of the DJI Phantom 4K platform using a HackRF One software-defined radio to capture and analyze its transmission behavior. Current work is focused on further solidifying the identifiable RF footprint associated with DJI and other platforms by examining signal characteristics across multiple operational states.

To ensure reliable signal characterization, data collection is conducted both in open environments and within a controlled RF isolation environment using a dedicated Faraday cage (RF isolation box). This controlled testing environment allows researchers to isolate drone emissions from ambient RF noise and identify repeatable transmission patterns with greater confidence.

**Keywords:** Drones Frequency LEO MUICS Forensics

**Title:** The Meta Horizon Android Application

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**Research Sponsors:** Not Applicable

**Abstract**

Virtual reality has become an increasingly popular platform, providing users with immersive social experiences. As the platform grows, it also presents opportunities for bad actors to abuse, manipulate, or exploit users within these environments. Despite the rapid expansion of virtual reality technologies, several areas remain under-researched. One such area is the forensic artifacts left on Android devices by the Meta Horizon application when it is used to connect to a Meta Quest 2.

This research aims to identify significant artifacts generated on an Android device through normal interactions with the headset and the mobile application. Artifact generation will occur through routine use of the headset, followed by interaction with the mobile application to connect to the device and access social features. After these activities are performed, the Android device will be rooted and forensically imaged to allow detailed analysis of application data.

Once the device image is obtained, unique identifiers and other significant artifacts will be identified and documented. These artifacts will then be used to develop an automated workflow through a plugin module for Autopsy, an open-source digital forensic analysis platform. The module will parse and organize the recovered data to assist investigators in identifying relevant evidence.

This work contributes to the expanding field of virtual reality and mobile digital forensics by documenting previously unexamined artifacts and providing an automated method for parsing these artifacts within a widely used forensic analysis tool.

**Keywords:** Forensics, VR, Android, Autopsy, Meta

## UGP-66

**Title:** Compost impacts on soil physical characteristics, OM content, and *Raphanus sativus* growth across incorporation methods

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**Research Sponsors:** Department of Natural Resources and Earth Sciences and Marshall University Compost Facility

### Abstract

Soil degradation and compaction in urban and disturbed environments often results in a loss of organic matter and reduced soil permeability which can negatively impact plant growth. This project evaluated the impact of compost application methods on soil physical properties and plant development in an Udorthents soil by comparing three experimental treatments: compost incorporation through tillage, tilled-only soil with no amendment, and surface compost topdressing. Commercially produced compost “Herd Dirt” obtained from the Marshall University Composting Facility was used as the amendment source. A staggered plot design with four 3ft x 6ft bed replicates per treatment, separated by vegetative buffers, was established. Radishes (*Raphanus sativus*), grown under protective low tunnels and netting to support growth during cooler conditions, served as a bioassay to assess compost application's impact on root and shoot growth. The radishes were planted in rows with seeds 2 inches apart and each row 6 inches apart. A total of 48 radish (*Raphanus sativus*) seeds per plot.

The study examined changes in soil organic matter (SOM), soil color, and soil structure after compost application and radish bioassay as well as radish growth differences for root and shoot tissues upon bioassay completion. SOM was quantified using the loss on ignition (LOI) method to estimate organic carbon content initially present (0 days), post-application (64 days after compost application), at planting (112 days after compost application), and at harvest (140 days after compost application). Texture, determined using the by-feel method after initial sampling, was determined to be sandy clay loam. Statistical analyses were conducted to identify significant differences in SOM and radish growth between treatments. The project aimed to determine whether direct compost incorporation or surface application produced a greater improvement in soil structure, SOM accumulation, and radish growth compared to the control.

**Keywords:** conservation tillage, compost, soil organic matter, soil health

## UGP-67

**Title:** Na<sup>+</sup>/K<sup>+</sup>-ATPase  $\alpha$ 1 is Required for HIF-1 $\alpha$  Activation in Human Cardiomyocytes

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**Research Sponsors:** Not Applicable

### Abstract

Cardiac hypertrophy is an adaptive response to stress that can progress to heart failure when dysregulated. The Na<sup>+</sup>/K<sup>+</sup>-ATPase (NKA)  $\alpha$ 1 isoform functions not only as an ion pump but also as a signaling scaffold activated by NKA-specific ligands of the cardiotonic steroids (CTS) family. Hypoxia-inducible factor-1 $\alpha$  (HIF-1 $\alpha$ ) has emerged as both a regulator of hypertrophic remodeling and a downstream target of CTS. Previous studies suggest that high-doses of CTS inhibit NKA-dependent ion transport, increasing intracellular sodium and promoting HIF-1 $\alpha$  stabilization, whereas low-doses of CTS preferentially activate NKA $\alpha$ 1-dependent signaling with minimal pump inhibition. Whether HIF-1 $\alpha$  activation is driven by sodium accumulation or NKA $\alpha$ 1 signaling remains unclear.

To address this question, we generated a CRISPR-mediated knockout (KO) of NKA $\alpha$ 1 in human cardiomyocytes (AC16). NKA $\alpha$ 1 KO reduced  $\alpha$ 1 expression by 65% ( $p < 0.001$ ,  $n = 10$ ) and Na<sup>+</sup>/K<sup>+</sup>-ATPase-specific hydrolytic activity by 80% ( $p < 0.05$ ,  $n = 5$ ), resulting in significantly elevated intracellular sodium levels compared to wild-type (WT) ( $126.2 \pm 2.6$  vs  $243.7 \pm 12.7$  nmol/mg  $p < 0.01$ ,  $n = 4$ ). Treatment with the CTS ouabain (100 nM, 1 h) further increased intracellular sodium in both WT and KO AC16 cells ( $170.6 \pm 4.0$  vs  $411.3 \pm 13.6$  nmol/mg;  $p < 0.01$ ,  $n = 3$ ). In WT AC16 cells, ouabain increased HIF-1 $\alpha$  expression by 30% as assessed by western blot ( $n = 4$ ,  $p < 0.05$ ). In contrast, ouabain failed to activate HIF-1 $\alpha$  in NKA $\alpha$ 1 KO AC16 cells, despite marked sodium accumulation. Treatment with pNaKtide (1  $\mu$ M, 30 min), a peptide designed to block NKA/Src signaling without pump inhibition, attenuated ouabain-induced HIF-1 $\alpha$  activation in WT AC16 cells.

Together, these findings suggest that sodium accumulation alone is insufficient to drive HIF-1 $\alpha$  activation. Rather, NKA $\alpha$ 1-dependent signaling is required for ouabain to induce HIF-1 $\alpha$  in human cardiomyocytes. Targeting the NKA $\alpha$ 1–HIF-1 $\alpha$  signaling axis may represent a promising therapeutic strategy in cardiac hypertrophy.

**Keywords:** Heart, Sodium, Cardiotonic Steroids, Signaling

## UGP-68

**Title:** Na/K-ATPase Inhibition Decreases Oxidative Metabolism in AC16 Human Cardiomyocytes.

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**Sponsoring Institutions:** School of Medicine, College of Science, NIH

**Research Sponsors:** (Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence)

### Abstract

Ouabain (OUA) is a specific inhibitor of Na/K-ATPase (NKA)-mediated ion-transport. Using isolated perfused rat hearts, studies have shown that OUA-induced increase in cytosolic Na<sup>+</sup> reduces mitochondrial Ca<sup>2+</sup> via the mitochondrial Na<sup>+</sup>/Ca<sup>2+</sup> exchanger and the Ca<sup>2+</sup>-dependent activity of key metabolic mitochondrial enzymes. This mechanism could link alteration of NKA and oxidative phosphorylation in heart failure patients, but has not been tested in human cardiac myocytes. Accordingly, the aim of this study was to test whether OUA decreases oxygen consumption rate (OCR) in the AC16 human cardiac myocyte cell line (ATCC CRL-3568). Triplicate wells of AC16 cells were treated with OUA 1 $\mu$ M or vehicle for 2 hours. Cellular Na<sup>+</sup> was measured using inductively coupled plasma atomic emission spectroscopy. OCR was measured using the Seahorse Real-Time Cell Metabolic Analyzer. Data were normalized by cell count and analyzed using Wave Desktop software. Groups were compared by two-tailed unpaired Student's t-test. OUA increased cellular Na<sup>+</sup> by 5-fold (p=0.0011, n=4). Acute response to OUA displayed a 5-fold decrease in OCR (p=0.0001, n=4), along with decreased maximal respiration (p=0.0504, n=4). Hence, we concluded that OUA-mediated NKA inhibition impairs mitochondrial function and reduces metabolic flexibility in AC16 human cardiac myocytes. The decreased oxygen consumption and respiratory capacity, coupled with increased cellular Na<sup>+</sup>, supports a mechanism where NKA activity regulates mitochondrial efficiency via Ca<sup>2+</sup>-dependent metabolic pathways, which may represent a new therapeutic target in heart failure progression.

**Keywords:** Ouabain; Na/K-ATPase; AC16 cells; Mitochondrial metabolism.

## UGP-69

**Title:** Tripartite Synapse Maturation in the Adolescent Orbitofrontal Cortex: Integrating Spatial Transcriptomics and Immunohistochemistry

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**Sponsoring Institutions:** School of Medicine

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

### Abstract

During adolescent development, synaptic maturation within the brain is critically important for establishing the appropriate neuronal circuitry necessary for the development of higher cognitive function. Astrocytes, which are non-neuronal glial cells, mediate this maturation through ensheathment of the synapse via their peripheral astrocyte processes (PAPs), and this structure is also known as the tripartite synapse. Communication, and thus, proximity, between PAPs and synapses is essential for establishing appropriate astrocyte-neuronal crosstalk. Previously, our laboratory has demonstrated that adolescent intermittent ethanol (AIE) exposure disrupts the proximity between PAPs and synapses within select subregions of the orbitofrontal cortex (OFC), a region of the brain essential for higher order cognitive function. Specifically, we have demonstrated that there is a loss in PAP-synaptic coupling within the ventral OFC due to ethanol exposure, but not the lateral OFC. It is not well understood how PAP ensheathment of synapses occurs during this developmental period, when maturation is complete, and if the maturation process varies across OFC subregions and sexes.

Here, we investigate how normal synaptic maturation during adolescence may predispose certain subregions of the OFC to PAP-synaptic decoupling following ethanol exposure. We hypothesize that the varying subregion-specific maturation states of the tripartite synapse predict vulnerability to AIE-induced loss of PAP-synaptic proximity.

To test our hypothesis, mice were sacrificed and brains were collected at three developmental stages: postnatal day (PND) 30, 46, and 72. The brains were fixed, and consecutive 5 $\mu$ m brain sections were collected on slides. Adjacent sections were prepared for immunohistochemistry (IHC) and spatial transcriptomics (ST), allowing the alignment and overlay of the tripartite synapse with changes in gene expression. Sections prepared for IHC were imaged via stimulated emission depletion (STED) microscopy, allowing for the distance between the pre- and post-synaptic terminals, as well as between the PAP and the synapse to be quantified across all developmental timepoints. Sections prepared for ST were stained with a SPY555 nuclear stain, and a confocal tiled image was collected for alignment. Changes in gene expression were determined following Visium CytAssist HD and analysis conducted by 10X Genomics. Finally, the SPY555, CytAssist, and IHC images were overlaid and aligned to determine the relationship between tripartite synaptic proximity and changes in gene expression across our developmental timepoints.

Based on our preliminary results and previous studies, we predict our data will demonstrate higher levels of ongoing maturation within the ventral OFC when compared to the lateral OFC. We further expect changes in gene expression, indicative of maturation, to correlate with changes in PAP-synaptic proximity.

These data will explain the process by which the tripartite synapse matures across development and could reveal why the adolescent, maturing brain is particularly vulnerable to alcohol exposure and impairs cognitive processing and decision making later in life.

**Keywords:** astrocyte, maturation, spatial, tripartite, neurodevelopment

## UGP-70

**Title:** Rosiglitazone Restores Astrocyte Function Sex-Dependently Following Adolescent Alcohol Exposure

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**Research Sponsors:** Not Applicable

### Abstract

**Background:** Excessive binge drinking often begins during adolescence and peaks in early adulthood, a critical period of on-going brain maturation. Human studies show that adolescent binge drinking can result in long-term behavioral dysregulation and increased risk of developing an alcohol-use disorder in adulthood. Using the adolescent intermittent ethanol (AIE) model, we previously observed sex-dependent maladaptive changes in contextual fear conditioning task that were associated with dorsal hippocampal (dHipp) astrocyte reactivity, aberrant astrocyte signaling, bioenergetic disruption, and increased oxidative stress. Additionally, we observed that rosiglitazone (ROSI), a drug used for Type-II diabetes, may be an effective therapeutic capable of reducing neuroinflammation and neurodegeneration. Here we hypothesize that ROSI administration is sufficient to rescue AIE-induced oxidative stress, tripartite structure, and astrocyte reactivity in adulthood.

**Methods:** On PND 24, male and female Sprague Dawley rats underwent AIE (5g/kg i.g.) or H<sub>2</sub>O (control) for 10 doses over 16 days. Animals then received 20 doses of either ROSI (20 mg/kg i.g.) or Vehicle (2% methyl cellulose in H<sub>2</sub>O). On PND 72, animals were sacrificed and brain tissue was collected. Immunohistochemistry (IHC) was performed to determine whether ROSI was sufficient to rescue the effects of AIE on biomarkers of oxidative stress, astrocyte reactivity (GFAP), and tripartite structural integrity in the dHipp. Following IHC, brain slices were imaged using stimulated depletion emission microscopy (STEM) or confocal microscopy and analyzed using Synbot (tripartite colocalization and oxidative stress marker expression) and Imaris (astrocyte branch morphology) followed by statistical analysis using GraphPad Prism.

**Results:** Following AIE, we observed a sex-specific increase in peripheral astrocyte process (PAP) proximity to inhibitory synapses and loss of proximity at excitatory synapses within the male dHipp, both of which were rescued by ROSI administration. In females, no changes in tripartite PAP-synaptic colocalization were observed within the dHipp at inhibitory or excitatory synapses. This is consistent with previous findings showing that behavioral deficits in females are more associated with changes in prefrontal and amygdala. ROSI administration in the females resulted in a reduction in astrocyte-specific 4HNE and PPLN expression in both AIE and control group. In contrast, the males displayed an increase in these oxidative stress markers in the AIE+ROSI group. ROSI administration resulted in no changes in GFAP expression in either sex suggesting its effects occur through mechanisms beyond astrocyte reactivity, potentially involving structural remodeling of astrocyte processes. Astrocyte branch morphology will also be shown.

**Conclusions:** These results indicate that ROSI administration influences the long-term effects of AIE in a sex-specific manner. Future studies will investigate the region-specific effects of ROSI in the prefrontal cortex and amygdala, particularly in females, and further investigate how ROSI influences astrocyte metabolism, oxidative stress signaling, and synaptic function following AIE.

**Keywords:** Rosiglitazone; astrocyte function; neurodegeneration

## UGP-71

**Title:** NL1 Restores Astrocyte Function and Reverses Cognitive Deficits Following Adolescent Intermittent Ethanol Exposure

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**Sponsoring Institutions:** School of Medicine, Hershel 'Woody' Williams Veterans Affairs Medical Center

**Research Sponsors:** Not Applicable

### Abstract

**Introduction:** Binge drinking during adolescence disrupts this maturation process and is strongly associated with long-term cognitive impairment and increased risk for alcohol use disorder. Within our lab and others, adolescent binge drinking can result in long-term behavioral dysregulation and increased risk of developing an alcohol-use disorder in adulthood. Using our adolescent intermittent EtOH (AIE) model, we observed behavior impairments in contextual fear conditioning (CFC), mitochondrial dysfunction, and disrupted astrocyte calcium (Ca<sup>2+</sup>) signaling. Therefore, we employed to use of NL-1, glitazone-derived compound, that improves mitochondrial redox and stress signaling without off-target effects. The objective of this study was to determine whether NL-1, a mitoNEET-targeting ligand, regulates mitochondrial function, can restore astrocyte function and improve behavioral outcomes following adolescent intermittent ethanol (AIE) exposure. We hypothesize that NL-1 will normalize astrocyte Ca<sup>2+</sup> signaling, restore mitochondrial homeostasis, reduce oxidative stress-associated dysfunction, and reduce AIE-induced freezing deficits.

**Methods:** On PND 24, male and female Sprague Dawley rats underwent AIE (5g/kg i.g.) or H<sub>2</sub>O (control) for 10 doses over 16 days. On PND 52, animals received an injection of astrocyte and neuronal GCaMP6F (Ca<sup>2+</sup>) sensors followed by 20 doses of NL-1 (10 mg/kg i.p.) or saline (10 mg/kg i.g.). On PND 72, animals underwent CFC paradigm assessed medial prefrontal cortex (mPFC)-dependent learning. Using fiber photometry, astrocyte Ca<sup>2+</sup> dynamics were measured in the mPFC during behavioral tasks. Following behavior testing, animals were sacrificed, and brain tissue was collected for immunohistochemistry (IHC). Following IHC, brain slices were imaged using stimulated depletion emission microscopy (STEM) or confocal microscopy and analyzed using Synbot (tripartite colocalization and oxidative stress marker expression) followed by statistical analysis using GraphPad Prism.

**Results:** In female rats, AIE exposure produces deficits in contextual fear conditioning, as evidenced by reduced freezing behavior during retention compared with H<sub>2</sub>O controls. AIE animals also exhibit impaired astrocyte calcium responsiveness in the mPFC, suggesting imbalanced Ca<sup>2+</sup> homeostasis. Following puncta quantification, NL-1 administration attenuated an AIE-induced upregulation in oxidative stress biomarkers (4HNE and PPLN). Ongoing analyses will determine whether NL-1 treatment restores normalizes astrocyte calcium signaling, and reverses AIE-induced behavioral impairments.

**Conclusions:** These results support the hypothesis that AIE produces astrocyte dysfunction that contributes to behavior deficits. Identifying pharmacological therapeutic strategies that restore astrocyte bioenergetic resilience may provide a novel avenue for protecting neurobehavioral performance. These results will help further our understanding of how the negative effects of AIE can be rescued through the recovery of the astrocyte-specific bioenergetic function and illustrate a correlation to behavioral outcomes.

**Keywords:** NL1

## UGP-72

**Title:** Functional Characterization of Regulatory Elements in the TYMP Promoter

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**Sponsoring Institutions:** School of Medicine

**Research Sponsors:** Not Applicable

### Abstract

Obesity and metabolic dysfunction-associated steatotic liver disease (MASLD) have become global epidemics and are major independent risk factors for cardiovascular disease and type 2 diabetes. However, the molecular mechanisms underlying these metabolic disorders remain incompletely understood. Our laboratory recently demonstrated that thymidine phosphorylase (TYMP), a key enzyme in pyrimidine nucleoside metabolism, is significantly upregulated in obesity across multiple species, including mice, nonhuman primates, and humans. These findings suggest that TYMP may play an important role in metabolic dysfunction.

Peroxisome proliferator-activated receptors (PPARs) are nuclear receptor transcription factors that regulate genes involved in lipid metabolism, glucose homeostasis, inflammation, and energy balance. Three isoforms, including PPAR $\alpha$ , PPAR $\gamma$ , and PPAR $\delta$  (also known as PPAR $\beta/\delta$ ), play distinct but complementary roles in obesity and MASLD. Based on these observations, we hypothesized that PPARs may regulate TYMP expression at the transcriptional level. To explore this possibility, we analyzed the TYMP promoter region spanning 3,000 bp upstream of the start codon using TFbinder. Although no canonical PPAR response elements (PPREs) were identified, six potential PPRE-like sequences were predicted and designated PPRE#1–#6. These regions were amplified by PCR and cloned into the pGL4.25[luc2CP/minP] luciferase reporter vector using NheI and HindIII restriction sites. The resulting plasmids were transfected into AML12 cells, a mouse hepatocyte cell line, either together with a human PPAR $\alpha$  expression plasmid or treated with GW7647, a potent PPAR $\alpha$  agonist, for 2 hours. A Renilla luciferase plasmid (1/25 of total transfected plasmid) was co-transfected in all conditions to control for transfection efficiency. Cells were harvested in passive lysis buffer, and luciferase assays were performed to evaluate the promoter activity associated with each predicted PPRE. Data were expressed as fold change relative to the empty pGL4.25 vector. Among the six candidate elements examined, PPRE#1 showed no detectable promoter activity. PPRE#3 and PPRE#4 exhibited modest positive promoter activity, whereas PPRE#6 displayed strong promoter activity. In contrast, PPRE#2 and PPRE#5 appeared to exert suppressive effects, reducing luciferase activity by approximately 50%. Notably, these promoter activities were not significantly altered by PPAR $\alpha$  overexpression or GW7647 treatment. Further studies, including the use of PPAR $\alpha$  inhibitors and co-transfection with PPAR $\gamma$  or PPAR $\delta$ , are needed to identify the transcription factors responsible for regulating TYMP expression through these promoter regions.

**Keywords:** Thymidine phosphorylase, Peroxisome Proliferator-Activated Receptor, Promoter activity, gene regulation.

## GP-01

**Title:** Policy And Practice: How Technology Guidelines Influence Teaching Practices And Student Engagement In Catholic Schools

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**Sponsoring Institutions:** College of Education & Professional Development, MURC Graduate Creative Discovery and Scholars Award

**Research Sponsors:** Not Applicable

### **Abstract**

As digital technologies continue enhancing education, Catholic schools must address the role of policy in supporting innovations while safeguarding moral formation. This qualitative case study examines how technology policies influence educator practice and student engagement in one West Virginia Catholic school, serving students in grades one through eight. Using classroom observations and interviews, the Interactive, Constructive, Active, and Passive (ICAP) framework (Chi & Wylie, 2014) was used to interpret findings. Themes include diverse educator attitudes toward technology integration, classroom management challenges associated with technology-enhanced instruction, and raised concerns about distraction and screen dependence. This research highlighted the importance of policy as an instructional framework, offering insights for Catholic educators and a broader conversation on technology integration.

**Keywords:** Technology, Policy, Education

## GP-02

**Title:** The Impact of Loose Parts STEAM Provocations on Preschoolers' Cognitive and Social-Emotional Development

**Authors/Presenters:** Brooklyn

**College/School:** College of Education & Professional Development

**Mentors:** Dr. Monica DellaMea

**Sponsoring Institutions:** College of Education & Professional Development

**Research Sponsors:** Not Applicable

### Abstract

This action research study explored how loose parts integrated into STEAM provocations support preschoolers' cognitive and social-emotional development within a Reggio-inspired classroom at the Marshall University Early Education STEAM Center. The study involved twelve children ages three to five over a three-week period. The project was grounded in constructivist and sociocultural theory, drawing from Jean Piaget's emphasis on active exploration, Lev Vygotsky's concept of social learning within the Zone of Proximal Development, and the Reggio Emilia philosophy, which views the environment as the "third teacher."

The identified problem of practice was limited persistence, engagement, and collaboration during traditional center time. In response, open-ended STEAM provocations were implemented using materials such as corks, wire, tubes, clothespins, and recycled items. A mixed-methods approach included anecdotal records, reflection journals, photographic documentation, behavior checklists, and frequency tallies.

Findings indicated increased sustained engagement, collaborative dialogue, leadership behaviors, and expanded vocabulary use during loose parts explorations. Results suggest that intentional STEAM provocations using loose parts meaningfully support preschoolers' cognitive growth and social-emotional development while providing a structured framework for reflective teaching practice.

**Keywords:** Loose Parts Play, STEAM Education, Early Childhood Development, Social-emotion learning, Inquiry based learning

### GP-03

**Title:** Designing Inclusive Cybersecurity Learning Environments: A Community of Practice Model for Neurodiverse Student Success

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**Sponsoring Institutions:** College of Education & Professional Development, College of Science, Institute for Cyber Security

**Research Sponsors:** Not Applicable

#### **Abstract**

The growing demand for cybersecurity professionals has prompted national initiatives to expand workforce pipelines; however, traditional pedagogical approaches in cybersecurity education often overlook the needs of neurodiverse learners. Students with cognitive differences such as ADHD, autism spectrum conditions, and dyslexia frequently demonstrate strong pattern recognition, persistence, and systems-level thinking—traits associated with success in cybersecurity roles—yet face structural barriers in conventional instructional environments. This project explores the development of an inclusive educational model grounded in a Community of Practice (CoP) framework designed to support neurodiverse student engagement and retention within a university-based Cyber Forensics and Security program.

Drawing upon experiential learning strategies including capture-the-flag competitions, lab-based simulations, and mentored research opportunities, this initiative integrates flexible instructional design principles with workforce-aligned competencies derived from the NICE Cybersecurity Workforce Framework. The proposed CoP model connects faculty, students, peer mentors, and industry partners to foster collaborative learning environments that emphasize applied problem-solving, scaffolded skill development, and multiple pathways for demonstrating technical mastery.

Preliminary observations suggest that inclusive, practice-oriented learning environments may improve student persistence and self-efficacy while simultaneously aligning with federal workforce development priorities in cybersecurity. By situating neurodiversity as an asset rather than a deficit, this project contributes to emerging conversations around accessibility, talent identification, and sustainable workforce development within Centers of Academic Excellence in Cyber Defense (CAE-CD) designated institutions. The findings may inform scalable strategies for enhancing participation and success among underrepresented cognitive profiles in cybersecurity education.

**Keywords:** Neurodiversity, Cybersecurity Education, Community of Practice, NICE Workforce Framework, Experiential Learning

## GP-04

**Title:** 4-H Stem Ambassador Impact Study: The Lasting Effects Of Stem Service Learning Through Camp Instruction

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**Research Sponsors:** Not Applicable

### Abstract

This poster presentation shares findings from a mixed methods study examining the long-term impacts of a STEM-focused service learning program in which college students served as near-peer educators during summer youth 4-H programs. Although short-term outcomes of service learning are widely documented, far less is known about how these experiences influence participants years after their service concludes. This study addresses that gap by exploring the lasting effects on former participants across four domains identified in the Service Learning Benefit (SELEB) framework: practical skills, interpersonal skills, citizenship skills, and personal responsibility skills.

Survey data from former participants (n=75) and follow up interviews (n=14), combined with a focus group of recent participants (n=10), revealed consistently high perceived long-term development across all SELEB domains. Participants reported that facilitating informal STEM learning for youth strengthened their organization, adaptability, teaching techniques, and workplace readiness. Interpersonal skills (particularly communication, leadership, teamwork, and audience adaptation) were among the strongest areas of sustained growth.

Interview themes identified lasting impacts on SELEB skill domains. Many former participants described a clearer sense of purpose shaped by their service experience. Practical skills were developed in organization, time management, teaching, and instructional design. Interpersonal skills built through participation include communication, science translation, leadership, and facilitation. Citizenship skills included cultural awareness, inclusion, community engagement, and volunteerism. Personal responsibility outcomes included growth in confidence, autonomy, trust building, and professional accountability.

Finally, the program influenced academic and career trajectories. Participants described the experience as pivotal in confirming or reshaping career goals, strengthening graduate school applications, and developing a deeper understanding of how STEM knowledge can support youth and communities.

**Keywords:** STEM, service learning, near-peer, 4-H youth development, summer camps

## GP-05

**Title:** Literacy Across the Lifespan: An Analysis of Programs and Resources for Adolescent and Adult Literacy

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**Research Sponsors:** Not Applicable

### Abstract

Literacy Across the Lifespan: An Analysis of Programs and Resources for Adolescent and Adult Literacy is a project from CIRG 653, a graduate course in the College of Education and Professional Development. The course is part of my master's program in Literacy Education with a Literacy Specialist endorsement. The project begins by highlighting the population seeking to improve their literacy skills, primarily adults who feel isolated within society due to literacy deficits and adolescents who left high school without the literacy skills required for college- and career- readiness. There's a variety of reasons that these adolescents and adults seek literacy remediation, such as careers/employment, community participation, education (GED), or for family support. The project splits Adolescent and Adult programs into two separate categories. There are national, state, and local programs for adolescent literacy and adult literacy available in the United States, West Virginia, and Putnam/Kanawha/Cabell/Lincoln County. The national programs, such as AdLit, Pro Literacy, and National Literacy Directory have a multitude of online resources for educators and adult learners. The state programs, such as Ready, Read Write (RWW), WV GEAR UP, and WVAdultEd foster literacy educators around the state and prepare students for academic testing and training in high school and for college. The local programs, such as United Way of the River Cities, Tri-State Literacy Council, and Literacy Volunteers of Kanawha County help adolescents and adults connect with local educators to improve their literacy skills within the counties they reside in. Many of these adolescent and adult programs only require a bachelor's in education and/or a valid teaching certificate for instructors. The materials provided in these adolescent programs are decoding multi-syllabic words, expanding vocabulary, fluency practice, and explicit writing instruction. The materials provided in adult literacy programs are similar, but more individualized and differentiated based on student needs. The recommended instructional practices for adolescent literacy are explicit vocabulary instruction, explicit comprehension strategy instruction, opportunities for discussion of text, and opportunities for maximum engagement. The recommended practices for adult literacy programs are following an anchor (grounding the topic), add (introducing new content), apply (manipulating the content), and away (personalizing the content) approach. Overall, someone who views or listens to my project should expect to take away information about the variety of adolescent and adult literacy programs, the qualifications of instructors, a variety of resources, and the recommended instructional practices for educating all learners.

**Keywords:** adolescent literacy adult programs practices

## GP-06

**Title:** Convergence of Outputs When Two Large Language Models Interact in a Multi-Agent Setup

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**Research Sponsors:** This research was partially supported by the NASA Established Program to Stimulate Competitive Research (EPSCoR), Grant No. 80NSSC22M0027 by the NASA West Virginia EPSCoR Committee. Part of the computational requirements for this work were supported by re

### Abstract

In this work, we report what happens when two large language models respond to each other for many turns without any outside input in a multi-agent setup. The setup begins with a short seed sentence. After that, each model reads the other's output and generates a response. This continues for a fixed number of steps. We used Mistral Nemo Base 2407 and Llama 2 13B hf. We observed that most conversations start coherently but later fall into repetition. In many runs, a short phrase appears and repeats across turns. Once repetition begins, both models tend to produce similar output rather than introducing a new direction in the conversation. This leads to a loop where the same or similar text is produced repeatedly. We describe this behavior as a form of convergence. It occurs even though the models are large, trained separately, and not given any prompt instructions. To study this behavior, we apply lexical and embedding-based metrics to measure how far the conversation drifts from the initial seed and how similar the outputs of the two models becomes as the conversation progresses.

**Keywords:** Convergence in Multi-Agent, Agentive Conversation, Multi-Agent, Multi-LLM Interaction.

## GP-07

**Title:** Detecting Shadow AI: A Network-Based Framework for Identifying Unauthorized Artificial Intelligence Usage in Enterprise Environments

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**Sponsoring Institutions:** College of Business, College of Engineering & Computer Sciences

**Research Sponsors:** Not Applicable

### Abstract

The rapid enterprise adoption of generative artificial intelligence tools has introduced a new category of organizational risk commonly referred to as Shadow AI. Employees increasingly leverage platforms such as ChatGPT and AI-integrated SaaS tools without security oversight, creating potential pathways for sensitive data exposure, regulatory non-compliance, and intellectual property leakage. Traditional network security controls lack specialized mechanisms to identify and classify AI-specific traffic patterns, resulting in limited visibility into these emerging risks.

This research proposes the design and development of a minimum viable Shadow AI detection framework that leverages DNS, proxy, and network telemetry to identify unauthorized AI service usage within enterprise environments. The project includes the creation of an AI domain intelligence dataset, log-based detection queries, and a risk-scoring methodology aligned with governance frameworks such as SOC 2 and NIST Cybersecurity Framework.

The resulting framework aims to provide small and mid-sized enterprises organizations with a practical and cost-effective approach to detecting and managing Shadow AI activity and contributing to the emerging discipline of AI security governance.

**Keywords:** shadow AI, cybersecurity, DNS, governance, AI

## GP-08

**Title:** Generating Hierarchical JSON Representations of Scientific Sentences Using LLMs

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**Research Sponsors:** This research is partially supported by the NASA EPSCoR. Part of the computational requirement for this work is done using resources at the Pittsburgh Supercomputing Center (PSC) and Anvil at Purdue University

### Abstract

This paper studies whether structured representations can retain meanings of scientific sentences. Many scientific sentences cannot be reduced to one relation without loss of information. To address this, a lightweight LLM is fine-tuned to generate JSON structures from scientific sentences. The objective was to capture information contained in the sentence using a hierarchical structure. Each sentence is decomposed into a core component and a set of dependent components. To ensure JSON validity we used a training method that adds a structured validation agent in the loop. The structured representations are then used to reconstruct sentences with a generative model to test whether such representations are useful to retain meaning of the sentence. The evaluation compares the reconstructed sentences with the originals using semantic and lexical similarity. Our method is evaluated on a diverse set of scientific sentences sampled from multiple scientific domains. Our results show that Lightweight LLM models can be finetuned to generate JSON representations and those hierarchical structured formats preserve information effectively.

**Keywords:** scientific text representation, LLM fine-tuning, Mistral-7B, Semantic reconstruction, JSON representation

## GP-09

**Title:** Optimizing Skill Acquisition in Immersive Industrial Training Environments through Hierarchical Reinforcement Learning/Procedural Content Generation

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**Sponsoring Institutions:** College of Engineering & Computer Sciences

**Research Sponsors:** Not Applicable

### Abstract

Immersive virtual-reality (VR) systems are increasingly used in industrial training, yet most remain constrained by fixed task sequences and non-adaptive instructional design. This project enhances a hydroelectric maintenance simulator by introducing an adaptive learning framework that modifies feedback, task flow, and scenario complexity based on user behavior and performance. Drawing conceptually from hierarchical reinforcement learning and procedural content generation, the system dynamically responds to user errors, safety violations, and hesitation timing to maintain engagement and promote progressive skill acquisition. Generative AI is incorporated to supply context-sensitive instructional cues and scenario variation, improving clarity and realism during tasks such as draining, casing operations, rotor alignment, clog removal, fan maintenance, and leak patching. A comparative study will evaluate whether the adaptive system improves efficiency, reduces errors, and strengthens procedural retention relative to a non-adaptive baseline. The expected outcome is a responsive VR training environment and a generalizable foundation for future research in AI-supported industrial education.

**Keywords:** Virtual-Reality (VR), Reinforcement Learning (RL), and Procedural Content Generation (PCG)

## GP-10

**Title:** Investigation of Novel Virtual Impactor Designs on the Aerodynamic characteristics in Aerosol Jet Printing (AJP)

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**Research Sponsors:** NASA; NSF

### Abstract

This work presents a computational study examining how different exhaust port configurations influence the internal flow behavior and aerodynamics of a virtual impactor (VI) used in aerosol jet printing systems. Four geometric designs were analyzed using Computational Fluid Dynamics (CFD), each incorporating a different exhaust layout, specifically, a single perpendicular exhaust, dual perpendicular exhausts, dual parallel exhausts, and an annular exhaust configuration. The investigation evaluated fundamental aerodynamic characteristics, including velocity fields, pressure distributions, turbulence behavior, and recirculation patterns. Velocity contours showed the formation of a consistent high-speed jet in all designs, with visible flow splitting and axisymmetric deflection into the separation chamber. Design 2 exhibited the most balanced and symmetric velocity streamline patterns, whereas Design 3 showed irregular gradients near the collector inlet. Streamline analysis also indicated that Design 2 more effectively reduced counter circulation loops compared to the other configurations. Pressure results revealed that Design 1 maintained higher static pressure in the collector region, which may improve particle retention but could reduce inertial focusing. In contrast, Design 4 produced lower collector pressure, potentially enhancing inertial separation while increasing the likelihood of recirculation. Turbulent kinetic energy (TKE) and eddy viscosity distributions were similar across all cases, with turbulence primarily concentrated near the jet separation region. Overall, the results show the importance of exhaust port symmetry and distribution in controlling internal VI flow behavior and provides guidance for optimizing exhaust port geometry to balance flow stability, pressure and inertial separation efficiency in applications for high resolution printed electronics devices and components.

**Keywords:** Advanced Manufacturing; Aerosol Jet Printing (AJP); Computational Fluid Dynamics (CFD); Virtual Impactor (VI)

## GP-11

**Title:** Validity of using smartphone cameras and pose estimation algorithms for quantitative analysis of human dynamic movements

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**Sponsoring Institutions:** School of Physical Therapy

**Research Sponsors:** Not Applicable

### Abstract

**Context:** Accurately assessing and quantifying dynamic movements is an important task for all physical therapists. While high quality analysis is often limited to specialized laboratory settings, advancements in human pose estimation have introduced methods of using smartphone cameras to analyze movement in a more convenient setting. The purpose of this study was to assess the validity of OpenCap motion analysis against inertial measurement units (IMUs).

**Methods:** Participants (N=10, 9M/1F, 23.7±0.8 years of age, 1.75±0.12 meters in height, 80.2±14.1 kg in weight) were recruited using convenience sampling from the Marshall University School of Physical Therapy to perform movements such as walking, running, jogging backwards, jumping tasks, 90° cutting, and imitated abnormal gait patterns. We used two iPhones (iPhone 12 and iPhone 16 pro Apple Inc, USA) and web-based free software to capture motion via OpenCap. Simultaneously, we attached 7 IMU sensors on the lower body of the participants and capture motion via myoMOTION system (Noraxon USA Inc., Scottsdale, AZ, USA). In this abstract, we emphasized the comparison of lower extremity sagittal plane joint angle kinematics of walking, running, counter-movement vertical jump (CMVJ), and rebound jumping using descriptive analysis. During analysis, walking and running tasks were categorized as cyclic motions, and CMVJ and rebound jumping tasks were categorized as jumping motions. We utilized root mean square error (RMSE) to compare differences of joint angle time series data estimated by OpenCap and IMU methods. Pearson correlation coefficients (r) were used to analyze the movement pattern relationship between OpenCap and IMU data.

**Results:** Results indicated an average RMSE of 9.5°-12.7° (cyclic motions 10.7°-12.7°, jumping motions 9.5°-10.4°) for the 4 movements analyzed. Pearson correlation coefficients for the movements ranged from r=0.83-0.97 (cyclic motions r=0.83-0.86, jumping motions r=0.95-0.97), indicating strong positive correlation. When analyzing individual joint kinematics, the knee had the lowest average RMSE at 10.0° and the hip had the highest average RMSE at 11.4°. Analyzing Pearson correlation coefficients at each joint showed that the knee also produced the highest value at r=0.97 and the ankle had the lowest value at r=0.79. Ankle values are hindered by cyclic motions (r=0.65) but are highly correlated during jumping motions (r=0.92). Knee and hip correlations remain more consistent across the two types of movements (knee cyclic r=0.95, jumping r=0.98; hip cyclic r=0.92, jumping r=0.97).

**Conclusion:** In conclusion, OpenCap is subject to providing specific joint angle kinematics that are outside of clinically acceptable thresholds (<5°) compared to IMUs but has high success in capturing kinematic movement patterns during dynamic activities. Therefore, we suggest caution to use OpenCap for assessing specific joint angle kinematics. However, it has the potential to be an accessible and affordable method for analyzing dynamic movement patterns in a clinical setting.

**Keywords:** OpenCap; movement pattern; kinematics; dynamic movement

## GP-12

**Title:** Methodological Determinants of Viral Recovery and Archive Reliability in Wastewater-Based Epidemiology

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**Sponsoring Institutions:** College of Science

**Research Sponsors:** WVBPH, CDC

### Abstract

Wastewater-based epidemiology (WBE) enables community-level pathogen surveillance through analysis of disease markers in wastewater matrices. Settled solids from wastewater function as integrated biological repositories of the built environment, preserving composite molecule signals over time. While previous studies focused on RNA extraction efficiency and PCR variability, few have examined the influence of upstream processing methods on detection outcomes—fewer have evaluated the validity of using stored wastewater archives to infer the genomic composition of the original raw wastewater sample.

This study evaluated two settled solids archiving approaches—Plunge Retrieval and Decant Retrieval—and compared their performance to our laboratory's standard viral enrichment workflow, the CERES Nanotrap® particle concentration method, which directly concentrates viral and other microbial particles from raw wastewater rather than intentionally targeting solids. Multiple wastewater samples from local municipal wastewater treatment plants (WWTP) were homogenized and spiked with bovine respiratory syncytial virus (bRSV; Inforce3, Zoetis) as a full-process control. Triplicate aliquots were processed utilizing each method; semi-dewatered and wet settled solids were resuspended in Zymo DNA/RNA Shield, stored for one week, and extracted using the Quick-DNA/RNA Viral Kit by Zymo Research prior to RT-qPCR quantification.

Although statistical power was limited by sample size ( $n=3$ ), detectable performance trends were observed. Average bRSV concentration ( $gc/\mu L$ ) did not differ significantly between Plunge and Decant methods ( $p=0.3584$ ), though a significant difference was observed between Plunge and CERES methods ( $p<0.05$ ). The Plunge method produced the lowest mean  $C_T$  value (28.23) and demonstrated the greatest reproducibility ( $SD=0.2636$ ), whereas the Decant method exhibited greater variability in early testing.

Simple gravimetric analysis indicated that the Decant method yielded greater total solids recovery with lower deviation from the mean, suggesting improved physical consistency in solids collection. However, the mixed-phase nature of the Plunge-recovered material may enhance recovery of spiked viral particles and may provide broader representation of biological targets whose phase partitioning (solid-associated vs. aqueous) is unknown at the time of archive creation. To evaluate long-term archive utility, we are currently condensing raw wastewater archives into settled solids and performing repeat assays on samples originally processed and resulted 2 years prior, using digital droplet RT-PCR assays for Influenza A, Influenza B, and SARS-CoV-2.

**Keywords:** Wastewater Based Epidemiology, Settled Solids, PCR

## GP-13

**Title:** The Effects Repeated Arm Elevations Bicipital Tendon Stiffness

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Context:** Heavy physical repetitive work has been identified as a risk factor for the development of shoulder pain. One of the leading sources of shoulder pain in overhead throwing athletes is bicipital tendon injury (BTI). People with BTI experience pain with arm elevation and decreased shoulder strength. However, little research has explored the effects of an acute bout of exercise on the biceps tendon stiffness. Ultrasound elastography can be used to help determine tendon stiffness. The proposed research explored the effects of repeated arm elevations on tendon stiffness determined by ultrasound elastography. It is hypothesized that repeated overhead arm motion will increase the stiffness of the biceps tendon.

**Methods:** Sixteen (16) participants aged 20-24 years, without history of shoulder pain were included in the study. The participant was sitting down, ultrasound B mode and elastography images were collected during a maximal isometric shoulder flexion contraction. Participants then performed 30-45 weighted arm elevation motions, until they were fatigued. The ultrasound imaging was repeated. The elastography images were imported into Image J to determine the intensity of the blue signal. Increased blue signal intensity indicates greater tendon stiffness. Relative strain is calculated by dividing the blue signal intensity during the contraction by the intensity at rest, increasing relative strain indicated great stiffness.

**Results:** The intensity of the blue signal increased with muscle contraction (mean difference = 17.28,  $F(15,1) = 5.903$ ,  $P = 0.028$ ). The intensity of the blue signal was lower following the fatigue protocol, but the difference did not reach statistical difference (mean difference = 2.23,  $F(15,1) = 0.317$ ,  $P = 0.582$ ). The increase in the intensity of the blue signal during the muscle contraction was greater after the fatigue protocol (Mean difference =  $20.11 \pm 7.674$ ,  $P = 0.019$ ) than before the fatigue protocol (Mean difference =  $11.38 \pm 6.40$ ,  $P = 0.096$ ). The relative strain was not effects by the fatigue protocol (mean difference =  $0.7 \pm 0.07$ ,  $T = 1.094$ ,  $P = 0.291$ ).

**Discussion:** The increase in the blue signal during the contraction indicates that the biceps tendon stiffness increases during the muscle contraction and the fatigue protocol increases the stiffness of the biceps tendon at rest. It is unclear why the stiffness of the bicep tendon would increase following the fatigue protocol. Future research should explore the effects of repeated overhead motion on tendon stiffness in people with shoulder pain.

**Keywords:** Biceps tendon, Ultrasound, elastography, fatigue,

## GP-14

**Title:** The Effects of Repeated Arm Elevations on Supraspinatus Tendon Stiffness

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** Not Applicable

### Abstract

**Introduction:** Shoulder pain and dysfunction are associated with declines in activities of daily living and overall quality of life. One of the most injured structures of the shoulder is the rotator cuff tendons. Point prevalence of shoulder pain has been reported between 7-26% with a lifetime prevalence reported up to 67%. Exercise has been shown to reduce the occurrence of shoulder pain in the general population. Much effort has been devoted to improving the understanding of the prevention and treatment of shoulder pain. However, more information on the effects of acute exercise on the supraspinatus tendon is needed. This project will characterize the effects of repeated arm elevations on the stiffness of the supraspinatus tendon. This project will provide information that will guide the development of shoulder injury prevention programs and the rehabilitation of patients with shoulder pain.

**Methods:** Sixteen (16) participants aged 20-24 years, without a history of shoulder pain, were included in the study. Following the consent process, the investigators made all demographic, strength, and anthropometric measurements. B-mode and elastography ultrasound images of the participant's right shoulder were taken as described by Jacobson. The participant then completed a bout of repeat arm elevation exercises to fatigue the supraspinatus muscle. Following the fatigue protocol, the strength and ultrasound procedures were then repeated. The elastography images were imported into ImageJ to determine the intensity of the blue signal. Increased blue signal intensity indicates greater tendon stiffness. Relative strain is calculated by dividing the blue signal intensity during the contraction by the intensity at rest. Increasing relative strain indicated great stiffness.

**Results:** The intensity of the blue signal increased with muscle contraction (mean difference = 15.74,  $F(15,1) = 7.633$ ,  $P = 0.015$ ). The intensity of the blue signal was greater following the fatigue protocol, but the difference did not reach statistical significance (mean difference = 2.1,  $F(15,1) = 7.633$ ,  $P = 0.634$ ). The increase in the blue signal intensity during the muscle contraction was greater before the fatigue protocol (mean difference =  $22.19 \pm 6.24$ ,  $P = 0.003$ ) than before the fatigue protocol (mean difference =  $12.35 \pm 7.73$ ,  $P = 0.131$ ). The relative strain was not affected by the fatigue protocol (mean difference =  $0.8 \pm 0.05$ ,  $T = 1.351$ ,  $P = 0.197$ ).

**Discussion/Conclusion:** The increase in the blue signal during the contraction indicates that the supraspinatus tendon stiffness increases during the muscle contraction, and the fatigue protocol decreased the stiffness of the supraspinatus tendon during the contraction. This decrease in the blue signal might be the result of decreased force production of the supraspinatus muscle. Future research should explore the effects of repeated overhead motion on tendon stiffness in people with shoulder pain.

**Keywords:** Supraspinatus, ultrasound, elastography

## GP-15

**Title:** “From Screening to Safety”: STEADI in Action for Older Community-Dwelling Older Adults

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**Sponsoring Institutions:** College of Health Professions

**Research Sponsors:** N/A

### Abstract

**Purpose/Hypothesis:** This study aimed to assess the outcomes of a four-week exercise intervention intended to reduce fall risk among community-dwelling older adults.

**Number of Subjects:** Twelve adults aged 65 and older were recruited from Cabell County Community Services Organization centers in the Huntington, WV area.

**Materials and Methods:** Following IRB approval from Marshall University, participants engaged in a multi-component functional mobility program over four weeks. The intervention included six exercises—Single Leg Stance, Tandem Walk, Sit-to-Stand, Heel Raises, Side Leg Raises, and Step-Ups were performed three times per week. Pre- and post-intervention performance was measured using five standardized tools: the 30-Second Chair Stand, BERG Balance Scale, POMA, Timed Up and Go (TUG), and Gait Speed. Paired t-tests were conducted to assess statistical significance, and Cohen’s d was used to evaluate effect sizes.

**Results:** Significant improvements were observed in balance and mobility. BERG Balance Scale scores increased significantly (Mean difference = +2.91;  $t(11) = 4.70$ ;  $p < .001$ ;  $d = 1.36$ ), indicating better postural control. POMA scores showed moderate gains (Mean difference = +0.66;  $t(11) = 2.21$ ;  $p = .049$ ;  $d = 0.65$ ), reflecting improved stability and gait. Gait speed increased by 0.10 m/s ( $d = 0.39$ ), though not statistically significant ( $p = .21$ ). No significant changes were noted in the 30-Second Chair Stand ( $p = .86$ ) or TUG ( $p = .65$ ), suggesting limited impact on strength and functional speed. The most notable gains were seen in balance-specific outcomes.

**Conclusions:** The four-week exercise program significantly enhanced balance and mobility, as demonstrated by improvements in BERG and POMA scores. While gait speed trended upward, measures of strength and movement speed showed minimal change.

**Clinical Relevance:** Falls pose a serious threat to older adults, with one in four individuals over age 65 experiencing a fall annually, according to CDC data. These events can lead to fractures, hospitalization, functional decline, and increased mortality. This study supports the utility of targeted, short-term functional mobility interventions in improving balance and gait, offering a practical strategy to reduce fall risk in older adults.

**Keywords:** Fall prevention, older adults, balance training, STEADI program, community-dwelling older adults

## GP-16

**Title:** Consistent neural activation in response to food cues in the nudibranch *Berghia stephanieae*

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**Research Sponsors:** NSF award #OIA-2242771

### Abstract

The nudibranch *Berghia stephanieae* is an emerging model for invertebrate neurobiology because its central nervous system contains fewer than 20,000 neurons and is compact enough for whole-mount molecular mapping. However, no study has yet been able to produce a brain wide map of sensory processing in *Berghia* under defined stimulus conditions. To fill this gap, we developed an immediate early gene (IEG) based activity mapping protocol to identify neural populations activated by chemosensory food cues. Initially we used a combined protocol consisting of fluorescent in-situ hybridization chain reaction (HCR) and immunohistochemistry (IHC) to target several markers including c-fos and phosphorylated ERK (pERK). This approach produced high background noise and weak cue specificity, with pERK immunoreactivity visualized broadly across the brain, and inconsistent, sparse c-fos signal across replicate runs. We then optimized the protocol to use *Egr1* as the primary HCR readout. We also changed our method to minimize handling stress by adding overnight acclimatization, removing protease permeabilization (only necessary for IHC), shortening MgCl<sub>2</sub> anesthesia time, fixing the whole head immediately after stimulation, and dissecting the brain only after fixation. With this refined protocol, *Egr1* HCR showed consistent, food-cue specific upregulation of this IEG at 30 minutes and in subsequent runs at 45 minutes, with particularly strong expression in neurons within the rhinophore and cerebropleural ganglia of the nudibranch brain. Next, we will extend the food-cue exposure time points to 60 and 90 minutes to define the *Egr1* temporal peak in the rhinophore ganglia and test whether the neural activation propagates across ganglia. By establishing a defined stimulus time course map of food cue evoked activation, this work moves toward producing a brain wide, stimulus defined map of sensory processing in *Berghia*.

**Keywords:** *Berghia stephanieae*, *Egr1*, food-cue stimulation, hybridization chain reaction (HCR), immediate early genes (IEGs)

## GP-17

**Title:** Hydrologic Tracer Injections Refine Root Uptake Assumptions and Improve Dryland Vegetation Forecasts

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**Research Sponsors:** Funding was provided by: USDA NIFA #2024-67019-42506 and Marshall University. I (David Boak) was supported by the Marshall Graduate Student Creative Discovery and Research Award and Marshall Donald Cain Tarter Biological Sciences Student Research Scholars

### Abstract

Climate warming is leading to drier surface soils and larger precipitation events that drive water deeper into the soil. In the western U.S., deeply rooted shrubs are likely to benefit from these changes by accessing deeper soil moisture, potentially increasing shrub dominance and decreasing grass abundance. However, our understanding of how shrubs and grasses will respond to changing water availability largely relies on root biomass data that are known to sometimes misrepresent water uptake. Hydrologic tracer injection experiments, which involve injecting deuterium oxide at known depths, show promise in determining where roots are actively taking up water. Our goals were to (1) derive active water uptake values from tracer injection data and integrate those updated parameters into STEPWAT2, an individual-based plant simulation model, and (2) evaluate shifts in plant functional type relative importance under current climate conditions. Tracer uptake data were collected for seven dryland plant species at four sites across the western U.S. Deuterium oxide was injected at specific depth from 0 – 150 cm throughout soil profile, and transpired water was collected to estimate active root water uptake. Tracer-derived active water uptake was compared with STEPWAT2 root biomass-based water uptake, and depth- and functional-type-specific differences were used to generate and integrate revised root water uptake parameters into STEPWAT2. We found that uptake based on root biomass overestimates uptake in shallow layers and underestimates uptake in deeper layers for shrubs and grasses relative to tracer-derived uptake. This pattern was consistent across two field sites spanning multiple sampling seasons. Water uptake at our other two field sites exhibited opposite patterns. Variation in uptake patterns likely reflect regional differences in climate and soil texture that influence soil water availability and root uptake. Within sites, functional types exhibited similar depth-specific biases in uptake, indicating a similar response to soil water availability across depth. These findings indicate that refining active root water uptake parameters in plant simulation models will improve forecasts of how shrubs and grasses will interact under future climate. Additionally, shifts in abundance of shrubs and grasses will have implications on forage production, the management of plants to be grazed as feed for livestock and wildlife. Future work will investigate how improved representations of root water uptake from tracer data influence plant available soil moisture, shrub and grass relative importance, and plant functional type biomass by running simulations for 200 sites under current climate conditions.

**Keywords:** climate change, plant simulation model, sagebrush, dryland, ecohydrology

## GP-18

**Title:** Ecological niche modeling of phytoplankton in the Greenup pool of the Ohio River

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**Research Sponsors:** Not Applicable

### Abstract

Harmful algal blooms (HABs) are excessive phytoplankton growth that can cause harm to drinking water supplies, the health of humans and aquatic organisms, and local economies through prevention and treatment costs. Impacts may occur from excessive biomass or toxins produced by some cyanobacterial taxa. The complex interactions of abiotic and biotic factors in riverine ecosystems that trigger HABs are not well understood. The goal of this research is to identify major drivers of excessive phytoplankton growth and to test an early warning method for HABs that has potential to be widely applicable to other riverine systems and adaptable to various conditions. The Ohio River is a managed river system widely used for drinking water, recreation, navigation, and industrial applications. HAB events in the Ohio River in 2015 and 2019 highlight the need for research to understand relationships between algal groups and physiochemical parameters of a managed river system that trigger harmful algal blooms. Additionally, it is important to test versatile methods of HAB predictions. A niche modeling approach is used to test the prediction of the initiation and cessation for periods of excessive cell growth that may precede a bloom by using field samples and physiochemical conditions. The data used to train the ecological niche model is from daily sampling intervals from 2017 to 2021. The model is tested on bi-weekly field samples from May 2023 to November 2024 at four sites on the Ohio River. The physiochemical relationships investigated consist of flow, solar radiation, and water temperature as these parameters are known to influence cell growth. Nutrients are excluded because they are not limiting in the Ohio River, and consistent nutrient time series data are not available across all sites and years. The algal data consists of three functional groups for Chlorophyta and Cyanophyta. Niche modeling contributes to understanding algal community dynamics and may be useful for HAB prediction in large river systems.

**Keywords:** HAB, algae, Ohio River, model

## GP-19

**Title:** Using Remote Sensing Technology To Provide A Framework For Improving Hydrologic Models

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**Research Sponsors:** US Army Corps of Engineers

### Abstract

With increased storm intensity from climate change and urbanization, flash flooding has been an increasing issue globally and regionally. Although the factors influencing urban flash flooding are well-known, there is an increasing need for technology to accurately and remotely predict the chance of a flash flood occurring from any given rain event to give people time to prepare. The effects of disturbance in headwaters on downstream flooding are under-researched despite their hydrologic importance. This study aims to use multispectral satellite imagery to improve near real-time flood predictions in an urban area of a high gradient, 4th order stream impacted by flooding. Specifically, we utilize images from PlanetScope and Copernicus Sentinel-2 and synthesize spectral bands from the two images to create the NDVI, NDMI, MPDI, TWI, and digital number method (DNM), which uses raw spectral band values directly to predict soil moisture. We then evaluate the abilities of these indices and other variables to predict soil moisture within the headwater region of the urbanized watershed by using a linear regression and ridge regression. Significant differences between spectral index values at multiple sites were evaluated using the Kruskal-Wallis and the post-hoc Dunn's tests. Global Moran's I and spatial statistics were used to find the equation of best fit to predict soil moisture values when the assumption of independence was not valid. Of all indices tested, the NDVI and MPDI consistently had the greatest correlations with field soil moisture values.

**Keywords:** remote sensing, ArcGIS, satellite imagery, soil moisture

## GP-20

**Title:** Astrocyte Transcriptomic and Metabolic Stress Responses to Prenatal Opioid Exposure

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**Research Sponsors:** NSF

### Abstract

Astrocytes, the primary glial cell type in the central nervous system (CNS), play a central role in promoting synaptic development and regulating brain homeostasis. Astrocyte dysfunction at the "tripartite synapse" (e.g. axons, dendrites, and peripheral astrocyte processes) is thought to contribute to pathology in psychiatric and neurological disease, but long-term consequences of disruptions in tripartite synaptic development during early life are still largely unknown.

Our lab uses prenatal opioid exposure (POE) as a model of early life neurotoxic insult in the developing mouse brain. Preliminary findings in our lab using single-cell RNA sequencing (scRNA-seq) of astrocyte-enriched samples from postnatal day 10 (P10) mouse cortex revealed around 600 differentially expressed genes (DEGs) with POE compared to vehicle exposure. Prominent regulators of astrocyte structure, such as *Ntrk2* and *Hepacam*, along with functional genes like *Aqp4*, *Gja1*, and *Kcnj10*, were significantly downregulated in the POE groups. By contrast, many of the upregulated DEGs were associated with mitochondrial function, lipid metabolism, and oxidative stress. These results suggest that POE elicits a shift in astrocytic transcriptomes away from typical maturation milestones and support of synapses toward a maladaptive state of increased oxidative stress, disrupted lipid metabolism, and impaired cellular energetics.

Here, we used our mouse model of POE to study gene expression in the prefrontal cortex, a brain region critical for higher order cognitive function and the dopaminergic reward system. Pregnant C57Bl/6J mouse dams were orally dosed with sweetened condensed milk either by itself or containing the opioid buprenorphine (5 mg/kg) daily from gestational day 7 until postnatal day 11 (P11). Following animal euthanasia between days P30-P35 (equivalent to mouse adolescence), brains were fixed-frozen with 4% paraformaldehyde, followed by changes in 30% sucrose and tissue freezing medium. 10 micron-thick sections containing PFC were then processed for spatial transcriptomics (Visium HD, 10x Genomics). Next-gen sequencing was performed in the Marshall Genomics Core, and bioinformatic analysis is currently underway.

To complement the results of the preliminary scRNA-seq data, cell culture was used to investigate cellular mechanisms of metabolic and mitochondrial stress in astrocytes. Human astrocytes were cultured in an astrocyte growth medium and exposed to buprenorphine in the presence or absence of inhibitors against FABP7 and FABP3/5 to assess lipid metabolism pathways linked to POE-induced gene changes. Following treatment, cells were fixed onto coverslips and processed for fluorescence immunocytochemistry (ICC) and imaged using stimulated emission depletion (STED) microscopy. Markers 8-oxoG (oxidative nuclear damage) and TOM20 (mitochondrial structure and integrity) were used to assess neurotoxic states. This approach provides a mechanistic comparison for the investigation of transcriptional changes in lipid metabolism-related genes in astrocytes in an early life opioid model.

**Keywords:** Astrocytes, Spatial transcriptomics, Prenatal Opioid Exposure, Lipid metabolism

## GP-21

**Title:** Evaluating Satellite Indices for Harmful Algal Bloom Detection in the Ohio River Using PlanetScope Imagery

**Authors/Presenters:** Dr. Mindy Yeager-Armstead, Geneve Brady, Brealynn Harper, John Moccio ;  
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**Research Sponsors:** U.S. Army Corps of Engineers

### Abstract

Large river systems are difficult to monitor because their size, depth, and flow create strong spatial variability, while field sampling is costly and limited. In the Ohio River Greenup Pool, a remote sensing workflow using PlanetScope 8-band surface reflectance imagery (PSB.SD platform; 3-m spatial resolution, daily revisit) was developed to support harmful algal bloom (HAB) monitoring in turbid, regulated rivers. Imagery was processed using Usable Data Masks (UDM) to filter images with 95-100% area coverage and less than 30% cloud coverage to reduce skewed pixels. ArcGIS Pro's Band Arithmetic was applied to images to calculate indices for turbidity, chlorophyll-a, and cyanobacteria (phycocyanin). These indices were extracted from fixed main channel sites and paired with SENSE data collected at Greenup Dam, KY, USGS gage records from Ironton, OH, EXO sonde measurements, ERDC grab samples, BenthosTorch fluorescence readings, and laboratory phytoplankton counts. Results show that turbidity was the strongest and most consistent remotely sensed parameter, with the Normalized Difference Turbidity Index (NDTI) producing the strongest correlation, particularly with USGS turbidity data. Chlorophyll-a and cyanobacteria proxies were weaker and more variable, indicating that pigment-based metrics require further refinement in this turbid river environment. Overall, this workflow improves field efficiency and provides a transferable framework for future bloom monitoring and predictive development in large river systems.

**Keywords:** Harmful Algal Blooms, Remote Sensing, Spectral Indices, Water Quality, Ohio River

## GP-22

**Title:** Disseminated Candida parapsilosis Infection Complicated by Native Aortic Valve Endocarditis and Peripheral Arterial Embolization

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**Research Sponsors:** Not Applicable

### **Abstract**

Fungal infective endocarditis is a rare but highly morbid condition commonly caused by Candida species. Candida parapsilosis is an uncommon cause of native valve endocarditis and is increasingly associated with healthcare exposure. We report a 50-year-old woman with persistent Candida parapsilosis candidemia complicated by large native aortic valve vegetations and acute limb ischemia from arterial embolization, requiring surgical valve replacement and prolonged antifungal therapy.

**Keywords:** Candida parapsilosis, Fungal Endocarditis, Native Valve Endocarditis, Candidemia, Arterial Embolization

## GP-23

**Title:** Investigating the Effects of Inflammatory Cytokines on Cardiovascular Health

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**Sponsoring Institutions:** CAMC

**Research Sponsors:** Not Applicable

### Abstract

The risk of death due to congestive heart failure and other related cardiovascular issues has risen substantially. Inflammatory cytokines are well-known to be present and active in the disease state of patients with cardiovascular issues like myocarditis and congestive heart failure. Due to the conflicting roles of inflammatory cytokines in the progression of cardiovascular disease, it is important to accurately diagnose which stage of disease the patient is in so that appropriate therapy can be used. To properly determine the risk of anti-inflammatory medication which was used on patients in various stages of congestive heart failure (CHF), we analyzed electronic health record data from the TriNetX network, which includes 93 healthcare organizations from across the country. We defined our population by splitting heart failure patients into 2 cohorts: Patients with systolic or diastolic heart failure who received Anti-Inflammatory Cytokine Therapy (medications such as infliximab, etanercept, anakinra, tocilizumab, or corticosteroids) and patients with heart failure who did not receive these medication. Propensity score matching was conducted to account for variability in the groups. Patients who were on anti-inflammatory medication had a significantly higher risk of hospitalization, emergency medical visit, and death than those who were not on any medication ( $p = 0.001$ ). A significantly higher percentage of patients on the medications had diabetes ( $p = 0.03$ ), hypertensive comorbidities ( $p = 0.04$ ), and chronic kidney disease ( $p = 0.05$ ) than those who did not take the medication. The results appear to support our hypothesis that the use of anti-inflammatory cytokine inhibitors in patients with congestive heart failure significantly affects the patient's outcome, emphasizing the importance of determining the proper disease stage when prescribing these medications.

**Keywords:** Cytokine, Inflammation, Cardiovascular Health

## GP-24

**Title:** Non-Traumatic Cerebral Fat Embolism Mimicking Air Embolism During Hemodialysis

**Authors/Presenters:** Kelsey Crawford (crawford157@marshall.edu), Akbar Ali (ali55@marshall.edu), Christopher Potts (potts35@marshall.edu), Dr. Sheharyar Raashid (raashid@marshall.edu)

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**Research Sponsors:** Not Applicable

### Abstract

Cerebral fat embolism (CFE) is an uncommon cause of acute neurologic dysfunction and is classically associated with long-bone fractures and trauma. Non-traumatic presentations are increasingly recognized but remain diagnostically challenging, particularly in patients undergoing hemodialysis, where cerebral air embolism is a known complication. We report a case of a 70-year-old patient with end-stage renal disease on hemodialysis who developed acute aphasia and left-sided hemiparesis shortly after dialysis initiation. Initial non-contrast head CT demonstrated multiple punctate cortical hypodensities concerning for intracranial air emboli. CT angiography revealed no large vessel occlusion. Multidisciplinary imaging review suggested that attenuation characteristics and lesion distribution were more consistent with cerebral fat embolism or a fat-mimicking embolic phenomenon. MRI was contraindicated due to pacemaker incompatibility. The patient was managed supportively and demonstrated rapid neurologic improvement within 24 hours, with near-complete recovery. This case highlights the diagnostic complexity of low-attenuation embolic lesions during hemodialysis and underscores the importance of integrating imaging findings with clinical context to differentiate fat, air, and thrombotic embolic phenomena.

**Keywords:** Cerebral fat embolism; Hemodialysis; Cerebral air embolism; Stroke mimic; Computed tomography

## GP-25

**Title:** Catastrophic Bilateral Tension Pneumothorax In Advanced Fibrosing Interstitial Lung Disease

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**Research Sponsors:** Not Applicable

### Abstract

**Introduction:** Interstitial lung disease (ILD) encompasses a heterogeneous group of pulmonary disorders characterized by inflammation and fibrosis of the lung parenchyma. Patients with advanced fibrosing ILD are at risk for serious complications, including acute exacerbations, pulmonary hypertension, and spontaneous pneumothorax. Pneumothorax occurs with a cumulative incidence of 17.7% at three years in patients with idiopathic pulmonary fibrosis (IPF) and is an independent predictor of mortality (HR 2.85). While unilateral pneumothorax is well documented in this population, simultaneous bilateral spontaneous pneumothorax (SBSP) is rare, representing approximately 4% of all spontaneous pneumothorax cases, with fibrotic ILD not prominently represented in published series.

**Case:** A 64-year-old male with advanced fibrosing ILD-Interstitial Pneumonia with Autoimmune Features (IPAF), chronic hypoxemic respiratory failure on continuous home oxygen, and antifibrotic therapy with pirfenidone presented with acute dyspnea, hypoxemia, and cyanosis following exertion. Chest CT revealed a massive right-sided pneumothorax with tension physiology, contralateral pneumothorax, and extensive subcutaneous emphysema in the setting of severe underlying fibrotic lung disease.

**Discussion:** This case represents an exceptionally rare presentation: simultaneous bilateral tension pneumothorax with extensive subcutaneous emphysema and suspected BPF in advanced fibrotic ILD. To our knowledge, this constellation has not been previously reported. The Graf-Deuel series noted fibrotic ILD was not associated with SBSP. While Toshniwal et al. recently described the triad of pneumothorax, pneumomediastinum, and subcutaneous emphysema in IPF, their cases involved unilateral pneumothorax without tension physiology or BPF.

The pathophysiology of pneumothorax in fibrosing ILD relates to subpleural cyst and bullae formation secondary to traction bronchiectasis and architectural distortion, which are prone to rupture. The mechanism of bilateral involvement likely relates to the diffuse, symmetric nature of fibrotic lung disease, with rupture occurring simultaneously or in rapid succession following exertion. The suspected BPF added significant complexity; while bronchoscopic interventions such as endobronchial valves have demonstrated success rates of 83-100% in select populations, these require hemodynamic stability and favorable physiologic reserve, both of which were lacking in our patient.

Our patient's presentation differed from published series in several critical ways: (1) bilateral rather than unilateral involvement, (2) tension physiology requiring emergent intervention, (3) suspected BPF with persistent air leak, (4) extensive subcutaneous emphysema extending to the cervical region, and (5) requirement for mechanical ventilation. Published data demonstrate hospital mortality rates of 38% for IPF patients requiring chest tube drainage for unilateral pneumothorax; the combination of all five factors in our patient created a clinical scenario with essentially no prospect for recovery.

**Conclusion:** This case illustrates a catastrophic, previously unreported complication of advanced fibrosing ILD. Clinicians should maintain vigilance for this rare but devastating complication and engage in proactive advance care planning given limited treatment options when such events occur.

**Keywords:** Bronchopleural fistula, Interstitial Lung Disease, Bilateral Tension Pneumothorax, Interstitial Pneumonia with Autoimmune Features (IPAF)

## GP-26

**Title:** Alien Hand Syndrome as the Initial Manifestation of Acute Right Middle Cerebral Artery Ischemic Infarction

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**Research Sponsors:** Not Applicable

### Abstract

**Background:** Alien hand syndrome (AHS) is a rare neurologic disorder characterized by involuntary, seemingly purposeful limb movements accompanied by a sense of estrangement. It has been described in association with stroke, tumors, trauma, and neurodegenerative disease, but rarely presents as an initial manifestation of acute ischemic stroke.

**Case:** A 54-year-old male presented with sudden onset involuntary movements and numbness of the left arm. He reported recurrent, uncontrolled striking of his left thigh by the affected limb, without volitional control. CT angiography demonstrated occlusion of the M3/M4 segment of the posterior division of the right middle cerebral artery with associated ischemia. Intravenous thrombolytic therapy was administered with rapid symptom resolution. MRI revealed small infarcts in the right insular cortex. The patient was discharged neurologically intact on antiplatelet and statin therapy for secondary prevention.

**Conclusion:** This case highlights transient AHS as a rare presenting feature of right middle cerebral artery stroke. Early recognition is critical to ensure prompt stroke evaluation and timely reperfusion therapy.

**Keywords:** Alien hand syndrome; Acute ischemic stroke; Middle cerebral artery; Insular cortex; Atypical stroke presentation

## GP-27

**Title:** N-Myc Downstream Regulated 1 (NDRG1) Stabilizes Retinoblastoma Protein in Clear Cell Renal Cell Carcinoma.

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**Sponsoring Institutions:** School of Medicine

**Research Sponsors:** EDWARDS CANCER GRANT

### Abstract

NDRG1 is a stress response protein that is increased in clear cell renal cell carcinoma (ccRCC) due to biallelic loss of the Von Hippel-Lindau Tumor Suppressor (VHL) gene. NDRG1 is also a scaffold protein that can stabilize DNA repair proteins. Retinoblastoma protein is a tumor suppressor that controls whether a cell decides to commit to DNA replication. The role of Rb in VHL-null cancer is unique, because instead of inhibiting proliferation, its primary function is to promote cancer cell viability. Given that Rb and NDRG1 are simultaneously increased in ccRCC, we hypothesized that NDRG1 stabilizes Rb protein in this cancer. To this end, human ccRCC 786-O cells were transiently transfected with control non-targeting short interfering RNA (siRNA) or two NDRG1 targeting siRNAs that target different regions of NDRG1 mRNA. The results showed that NDRG1 protein was reduced by 80% in response to the NDRG1 siRNAs. The decrease in NDRG1 protein was associated with an 80% decrease in total Rb protein, and a 60% decrease in pRb (Ser780), and no change in Rb mRNA. This indicates that NDRG1 stabilizes Rb protein. We hypothesize that NDRG1 promotes the progression of ccRCC by stabilizing Rb, which promotes the viability of ccRCC cancer cells.

**Keywords:** NDRG1, Rb, ccRCC, VHL,

## GP-28

**Title:** Fremanezumab-Associated Psoriasiform Eruption: A Case Report

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**Research Sponsors:** Not Applicable

### Abstract

Calcitonin gene-related peptide (CGRP) inhibitors are widely used for chronic migraine prevention. While generally well tolerated, its immunomodulatory effects may trigger inflammatory skin reactions, including psoriasiform eruptions. This case presents a 32-year-old woman who developed a widespread morbilliform rash with psoriasiform histologic features following initiation of fremanezumab. She had no personal or family history of psoriasis, and her eruption improved upon discontinuation of the drug. This case highlights the importance of recognizing CGRP inhibitors as potential triggers of immune-mediated skin disease, even in patients without prior dermatologic history.

**Keywords:** Psoriasiform eruptions, drug reaction, CGRP inhibitors, fremanezumab

## GP-29

**Title:** Polymicrobial Synergy: How Klebsiella Enhances Antibiotic Resistance in MRSA Biofilms

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**Research Sponsors:** Not Applicable

### Abstract

Chronic infections, from diabetic ulcers to catheter-associated urinary tract infections, are notoriously difficult to treat. A primary reason is the ability of bacteria to form biofilms; structured communities encased in a protective matrix that shields them from both the immune system and antibiotics. While often studied as single species, these chronic infections are frequently polymicrobial, yet how different bacterial species interact within a shared biofilm to influence treatment outcomes remains poorly understood. This gap in knowledge is critical, particularly for infections involving methicillin-resistant *Staphylococcus aureus* (MRSA), a pathogen with limited therapeutic options, which often co-occurs with other bacteria like *Klebsiella pneumoniae*.

This study investigates the polymicrobial interactions between MRSA and *K. pneumoniae* within a biofilm. We hypothesized that their co-culture would result in enhanced biofilm formation and altered antibiotic tolerance compared to single-species communities. To test this, we established in vitro biofilm models of MRSA and *K. pneumoniae*, both in isolation and in co-culture. We then quantified total biofilm biomass, assessed the composition of the mixed community, and evaluated their susceptibility to a panel of broad-spectrum antibiotics.

Our findings reveal a pronounced and clinically significant synergistic effect. Co-culture biofilms exhibited a striking increase in total biomass, with *K. pneumoniae* emerging as the dominant species within the mixed community. Most importantly, these polymicrobial biofilms developed a robust tolerance to multiple antibiotics—a resistance phenotype that was not present when either species was cultured alone. This emergent property suggests that interspecies interactions can fundamentally alter the architecture and function of the biofilm community.

We conclude that the presence of *K. pneumoniae* fundamentally reshapes the MRSA biofilm environment, driving a synergistic interaction that leads to newly acquired antibiotic resistance. This work highlights the critical limitation of studying bacterial pathogens in isolation and underscores the urgent need to incorporate polymicrobial dynamics into the development of more effective therapeutic strategies for chronic, biofilm-associated infections.

**Keywords:** Biofilm, MRSA, *Klebsiella pneumoniae*, Polymicrobial infection, Antibiotic tolerance

## GP-30

**Title:** Reducing N-Myc Downstream Regulated 1 (NDRG1) Potentiates Etoposide Cytotoxicity in Clear Cell Renal Cell Carcinoma Cells.

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**Research Sponsors:** EDWARDS FOUNDATION

### Abstract

Clear cell renal cell carcinoma (ccRCC), the most common renal cancer, is characterized by biallelic loss of the VHL tumor suppressor, which stabilizes hypoxia-inducible factors (HIFs) and induces NDRG1, a protein involved in DNA repair, cell-cycle regulation, and apoptosis. We previously showed that ccRCC tumors exhibit increased phosphorylation of NDRG1 at Thr346 driven by the tumor-promoting mTORC2 pathway. Because etoposide, a topoisomerase II inhibitor, induces DNA damage and apoptosis, we asked whether mTORC2-driven NDRG1 expression could diminish etoposide-induced cytotoxicity by enhancing DNA repair or suppressing apoptosis. We therefore hypothesized that reducing NDRG1 would increase the sensitivity of renal cancer cells to etoposide. To test this, VHL-null, phospho-NDRG1-positive 786-O cells were treated with vehicle or a range of etoposide concentrations (0.1–100  $\mu$ M) for 1 day to establish a concentration–response curve. To determine whether NDRG1 modulates etoposide sensitivity, cells were transfected with non-targeting or NDRG1-targeting siRNAs using Lipofectamine, followed by treatment with vehicle or 1  $\mu$ M etoposide, and viable cells were quantified on days 1–3 using trypan blue exclusion and automated counting. Knockdown efficiency was confirmed by western blot using NDRG1 and  $\beta$ -actin antibodies. Statistical analyses were performed using one-way ANOVA. NDRG1 siRNA reduced NDRG1 protein by approximately 50%, and etoposide produced a 50% reduction in viability at 10–100  $\mu$ M in control cells after 1 day. Importantly, NDRG1 knockdown significantly enhanced the cytotoxic effect of 1  $\mu$ M etoposide, yielding reductions in viability of 60%, 70%, and 77% on days 1, 2, and 3, respectively greater than either treatment alone. Notably, NDRG1 knockdown alone reduced viability by 30–40%, suggesting a survival function for NDRG1 in ccRCC cells. These results support the hypothesis that lowering NDRG1 increases sensitivity to etoposide, by compromising DNA repair or promoting apoptosis. We propose that NDRG1 reduction enhances the pro-apoptotic response to etoposide and will evaluate apoptosis activation.

**Keywords:** NDRG1, ccRCC, chemotherapy, topoisomerase II, mTOR

## GP-31

**Title:** Intraoperative Hypotension and Short-Term Outcomes After Primary Total Hip Arthroplasty: A Retrospective Cohort Study

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### Abstract

**Aims:** Intraoperative hypotension (IOH) has been associated with adverse outcomes in noncardiac surgery, but its effect during total hip arthroplasty (THA) remains unclear. This study aimed to investigate whether absolute (AIOH) or relative (RIOH) IOH is a risk factor for adverse short-term outcomes following primary THA.

**Methods:** A retrospective review of 394 THAs performed at a single academic institution between September 2020 and April 2025 was conducted. AIOH was defined as any intraoperative mean arterial pressure (MAP) <65 mmHg, and RIOH as a  $\geq 20\%$  decrease from preoperative baseline MAP. Primary outcomes included all-cause 30- and 90-day readmissions and postoperative length of stay (LOS). Multivariable logistic regression was used to identify predictors of readmission and LOS > 1 day.

**Results:** 112 patients (28.4%) experienced AIOH during their THA. Neither the presence nor duration of AIOH was associated with readmission or LOS. RIOH occurred in 74 patients (22.5%), and was not associated with readmission or LOS, but was associated with higher rates of reoperation within 90 days (12.2% vs 2.4%,  $p = 0.001$ ). Estimated blood loss (EBL) independently predicted prolonged LOS across all models (OR 1.75 per 50 mL, 95% CI 1.33–2.31,  $p < 0.001$ ).

**Conclusion:** AIOH was not associated with an increased risk of adverse short-term outcomes following primary THA when defined by a fixed MAP threshold. RIOH and intraoperative blood loss demonstrated stronger associations with postoperative complications, but these findings require further evaluation. This study supports a more individualized approach to hemodynamic monitoring in primary THA.

**Keywords:** 1. Total hip arthroplasty 2. Intraoperative hypotension 3. Mean arterial pressure 4. Postoperative complications 5. Length of stay

## GP-32

**Title:** AI-Driven Identification of Stage-Specific Transcriptomic Biomarkers in Sepsis

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### Abstract

Sepsis induces dynamic, stage-specific transcriptomic remodeling; however, biomarkers that reliably distinguish between early and late stages remain incompletely defined. Here, we integrated differential gene expression (DEG) analysis with machine learning (ML) to identify robust and predictive transcriptomic biomarkers across the progression of sepsis. RNA-seq data from sham, early (6 hours), and late (24 hours) sepsis lung tissues were analyzed using DESeq2 ( $p_{adj} < 0.05$ ,  $|\log_2FC| > 1$ ), revealing extensive transcriptional alterations and clear separation between groups by principal component analysis. Functional enrichment demonstrated early activation of inflammatory and innate immune pathways, followed by sustained stress-response and metabolic dysregulation at later stages. To complement statistical DEG analysis, a Random Forest model was applied to identify features with high predictive power for classifying sepsis stages. The model achieved high classification accuracy (>90%), with top features including *Il17f*, *Mcmdc2*, *Alyreffm3*, *Eif4a-ps4*, *Lonrf2*, *Mpp4*, and *Snord89*. Notably, minimal overlap was observed between top DEGs and ML-selected features, highlighting that DEG analysis captures the most statistically significant expression changes, whereas machine learning identifies combinatorial patterns with strong predictive value. Together, these findings demonstrate that integrating transcriptomic analysis with AI-driven approaches reveals complementary biomarker sets that improve the robustness of sepsis classification. This strategy provides a powerful framework for stage-specific biomarker discovery and supports the development of precision diagnostics in sepsis.

**Keywords:** Sepsis, Transcriptomics, Explainable Machine Learning, Tissue-Specific Gene Expression, Biomarker Discovery

## GP-33

**Title:** Facial Cellulitis Mimicking Ludwig's Angina in a Patient With Chronic Myelogenous Leukemia on Dasatinib Therapy

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### Abstract

Immunosuppressed patients are at an increased risk for developing odontogenic and orofacial infections which can present with atypical processes and features that may mimic rare but life-threatening infections such as Ludwig's angina. Differentiating cellulitis from a deep neck space infection is often challenging in this population in acute settings due to a broad differential diagnosis and blunted inflammatory responses. This diagnostic uncertainty complicates acute risk stratification and may delay recognition of conditions requiring early airway evaluation and intervention.

We present the case of an 18-year-old male with chronic myelogenous leukemia on immunosuppression with dasatinib who developed unilateral facial swelling and severe odontogenic pain that was refractory to empiric antibiotic therapy. The patient's presentation with rapid clinical progression, early trismus, submandibular involvement, and floor-of-mouth tenderness raised significant concern for evolving Ludwig's angina. Laboratory evaluation demonstrated elevated inflammatory markers, including erythrocyte sedimentation rate and C-reactive protein, further complicating early assessment. Imaging was promptly obtained to determine the nature of the infection, and the patient was admitted for intravenous antibiotic therapy and airway monitoring. Clinical improvement ensued. This case highlights the diagnostic overlap between facial cellulitis and Ludwig's angina and underscores the importance of prompt imaging, airway monitoring, and clinical vigilance for risk stratification of immunocompromised in the acute setting to prevent life-threatening complications.

**Keywords:** Facial cellulitis, Ludwig's angina, Odontogenic infection, Immunosuppression, Dasatinib

## GP-34

**Title:** Decoding Gut-Brain Communication: Alcohol-Induced Microbial Stress via Biphasic Exposure in Male Sprague Dawley Rats

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

### Abstract

According to 2024 data from the U.S. Centers for Disease Control and Prevention (CDC), 17% of adults in the United States engage in binge drinking. Alcohol is known to disrupt the gut barrier, causing pro-inflammatory signal release that affects both the peripheral immune system and brain. Gut-derived metabolites and inflammatory signals cross the blood-brain barrier, prompting neurotoxicity. This study delineates the longitudinal impact of alcohol exposure on the gut-brain axis using four cohorts of male Sprague Dawley rats. Cohorts transitioned from an adolescent binge phase (PND 30-71) to a limited access two-bottle choice paradigm (PND 72-366), generating six exposure groups. Bacterial DNA was extracted from fecal samples. 16S rRNA amplicon sequencing with V3-V4 primers was performed using Illumina NextSeq 2000, with libraries sequenced in a 150 bp paired-end run. Raw reads were processed with DADA2 through the NIAID Nephel platform, identifying microbial taxa. PICRUSt2 predicted abundances of genes, enzymes, and metabolites. R packages “phyloseq,” “DESeq2,” and “ggpicrust2” enabled data visualization. Preliminary findings indicated that beneficial butyrate-producing bacteria lessened during binge drinking as did propionate-producing bacteria during a choice-based paradigm. EtOH-tolerant bacteria increased during binge drinking, with an age-dependent increase in *Helicobacter* suggesting a pro-inflammatory state. Stress-response genes have since been found across weeks, notably RsbU and RsbV. Alcohol, a stressor, was oxidized into aldehydes and acetate, activated by acetyl-CoA synthetase to form acetyl-CoA, a butyrate precursor. Enzymes were contributors to a pro-inflammatory state, the EptC enzyme synthesizing lipopolysaccharide and a virulence-associated IgA-cleaving protease. Amino acid breakdown (e.g., L-tryptophan) was prevalent.

**Keywords:** gut, brain, alcohol, stress, bioinformatics

**Title:** Na/K-ATPase Signaling Modulates Citrate Handling in the Renal Proximal Tubule in Nephrolithiasis

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**Research Sponsors:** NASA West Virginia Space Grant Consortium Graduate Research Fellowship Program #225021, NIH DK129937, and NIH Grant P20GM103434 to the West Virginia IDeA Network of Biomedical Research Excellence.

**Abstract**

Nephrolithiasis, also known as kidney stone disease (KSD), is an increasing global health burden influenced by both genetic and environmental factors. Recent integrated omics studies have identified ATP1A1, which encodes Na/K-ATPase  $\alpha$ 1 (NKA  $\alpha$ 1), as a key susceptibility gene in calcium oxalate (CaOx) stone formation. However, the mechanism remains unknown.

We have recently demonstrated a key regulatory role of NKA  $\alpha$ 1/Src receptor signaling in renal proximal tubule (RPT) function. RPT function affects urinary supersaturation by influencing the excretion and reabsorption of crystallization modulators such as citrate. Whether NKA  $\alpha$ 1/Src receptor signaling regulates RPT citrate handling to counteract hypocitraturia, a well-established risk factor for both occurrence and recurrence of kidney stones, has not been investigated.

To test the hypothesis that NKA/Src signaling activation in the RPT induces hypercitraturia and reduces CaOx stone formation, we used 8-10 weeks male mice genetically engineered to express a mutated NKA  $\alpha$ 1 with increased affinity for endogenous cardiotonic steroids (eCTS) to stimulate NKA/Src receptor function (NKAA1S/S, sensitive). Age-matched males with the naturally resistant low affinity receptor (NKAA1R/R, resistant) were used as controls. Mice were born with a normal Mendelian ratio, with no observable difference between  $\alpha$ 1S/S and  $\alpha$ 1R/R. The expected change of affinity was confirmed by a left-shift of enzymatic inhibitory dose-response curve to the CTS ouabain, without changes in total renal NKA activity or NKA  $\alpha$ 1 or  $\beta$ 1 protein content. Western blot analyses revealed increased phosphorylation of NKA  $\alpha$ 1 at Y260 in the renal cortex, consistent with an activation of eCTS/NKAA1/Src in the RPT of NKAA1S/S mice. At baseline, NKAA1S/S mice exhibited significantly higher urinary citrate excretion compared to NKAA1R/R (16.3 $\pm$ 1.9 vs. 8.1 $\pm$ 1.0 nmol/24h; n=7-10, P<0.0007). Following sodium glyoxylate injection to induce CaOx stones, NKAA1S/S mice displayed a marked reduction in CaOx crystal deposition as revealed by H&E staining under a polarized light microscopy.

These findings identify eCTS/NKAA1/Src signaling as a physiological regulator of citrate handling in the RPT and suggest that targeting this pathway may present a novel therapeutic strategy against nephrolithiasis.

**Keywords:** Endogenous cardiotonic steroids, calcium oxalate, ATP1A1, hypercitraturia, Src signaling

## GP-36

**Title:** Assessing The Long-Term Effects Of Prenatal Opioid Exposure On Astrocyte Morphological Development In Mouse Prefrontal Cortex

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**Research Sponsors:** Not Applicable

### Abstract

Prenatal opioid exposure (POE) has increased markedly in recent years, leading to a corresponding rise in neonatal opioid withdrawal syndrome (NOWS): a constellation of physiological symptoms that present when the newborn is abruptly weaned from the opioids in the maternal blood supply. Although opioid exposure is associated with neurological deficits, its specific impact on the developing brain remains incompletely understood.

Synaptogenesis is a critical component of brain development, relying on the coordinated activity of neurons and astrocytes within the tripartite synapse, which consists of the presynaptic neuron, postsynaptic neuron, and peripheral astrocyte process (PAP). While neuronal contributions have been studied extensively, the roles of astrocytes in early brain development have traditionally been less well-defined. Astrocytes are now recognized as complex glial cells that actively regulate synapse formation and maturation, in part through secretion of factors such as thrombospondins (TSPs) and hevin, which promote cortical synaptogenesis. In this study, we investigated how POE alters astrocyte growth, morphology, and physical interactions with excitatory synapses in the developing cortex. Using a mouse model in which pregnant females are exposed to the commonly prescribed opioid buprenorphine, we used viral labeling methods, immunohistochemistry, and confocal microscopy to assess astrocyte structural properties in various frontal cortical subregions, with significant differences emerging in the brains of opioid-exposed adolescent offspring compared to vehicle controls. Ultimately, understanding how opioids disrupt astrocyte function may uncover novel mechanisms underlying neurodevelopmental vulnerability and guide strategies to mitigate cognitive and behavioral deficits in affected children.

**Keywords:** Onions, Neonatal Opioid Withdrawal Syndrome (NOWS), Prenatal Opioid Exposure (POE).

## GP-37

**Title:** Loss of Heparan Sulfate N-deacetylase/N-sulfotransferase 1 in Retinal Pigmented Epithelial Cell Ameliorates Lipoprotein Aggregation in Bruch's Membrane

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**Research Sponsors:** Not Applicable

### Abstract

This poster explores the role of an enzyme called N-deacetylase/N-sulfotransferase 1 (NDST1) on mice with different genetic backgrounds and diets to potentiate its effects on lipoprotein aggregation in the Bruch's membrane of the retina, forming aggregates called drusen. Drusen formation is the key factor in the development of Age-Related Macular Degeneration (AMD). AMD is the leading cause of vision loss in the elderly in industrialized nations, and there is currently no treatment or cure for the dry (drusen-only) type, which is the most common form. By exploring how different genes and enzymes interact to cause the development of AMD, we are one step closer to finding effective treatments for this disease.

**Keywords:** ophthalmology, macular degeneration, basic science, genetics

## GP-38

**Title:** Reactive Oxygen Species Damage to Human Proximal Tubule Epithelial Cells is Attenuated by Pterostilbene

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### Abstract

Platinum-based chemotherapies like cisplatin can cause nephrotoxicity as a side effect, which can lead to acute kidney injury (AKI). This damage can be caused by the increase in reactive oxygen species (ROS), such as hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). Natural products have shown some promise in reducing cisplatin-induced nephrotoxicity by mitigating oxidative stress. Pterostilbene (PTER) is a resveratrol analogue that has shown greater antioxidant activity and bioavailability than resveratrol. This project aims to investigate PTER's protective effects on human proximal tubule epithelial cells against H<sub>2</sub>O<sub>2</sub>, a prominent ROS produced by cisplatin in the proximal tubule. The model used in this study is an immortalized non-cancerous human proximal tubule epithelial cell line, or HK-2 cells. All experiments were conducted as 4 individual experiments. Differences between groups were analyzed using an analysis of variance (ANOVA), followed by a post hoc test, and statistical significance was determined at  $p < 0.05$ . HK-2 cells were pretreated for 1hr with 0-10  $\mu$ M PTER followed by a 24hr co-incubation with 0-2000  $\mu$ M H<sub>2</sub>O<sub>2</sub> or 0-30  $\mu$ M cisplatin. Following this co-incubation, cell viability was assessed using an MTT assay and Cell Countess. Western blot was performed to assess activation of apoptosis (Caspase 3 cleavage), autophagy (LC3BI & II), and inflammation (TNF $\alpha$ ). PTER was found to partially reverse both MTT and cell viability decline in HK-2 cells treated with H<sub>2</sub>O<sub>2</sub> and cisplatin. PTER was also found to decrease cleaved caspase 3 protein expression and increase LC3BII/I ratio, indicating a decrease in apoptosis and an increase in autophagy, signaling an effort to repair damage. There were no differences between groups for TNF $\alpha$  expression. In this study, PTER decreased the damage caused by H<sub>2</sub>O<sub>2</sub> and cisplatin by reducing apoptosis and activating autophagy. PTER also partially restored cell viability decline caused by H<sub>2</sub>O<sub>2</sub> and cisplatin as evidenced by MTT and Cell Countess values. (This project was partially funded by NIH Grant P20GM103434.)

**Keywords:** ROS, Pterostilbene, H<sub>2</sub>O<sub>2</sub>, Cisplatin, Nephrotoxicity

**Title:** Ocular Clues to Liver Disease: A Strategic Diagnostic Lens

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**Research Sponsors:** Not Applicable

**Abstract**

**Background:** Hepatic diseases frequently present with ocular manifestations that aid diagnosis, provide prognostic data, and guide therapy. Despite the clear utility of the liver-eye axis, the literature lacks reviews that categorize these manifestations by etiology. This review evaluates current evidence to identify ocular findings that serve as clinical tools for diagnosis, prognosis, and therapeutic monitoring of hepatic pathologies.

**Methods:** A narrative review was conducted using PubMed and Google Scholar to identify English-language articles addressing ocular manifestations associated with liver disease. The primary search encompassed publications from 2000 to 2025, with inclusion of select foundational works published prior to 2000 when they represented seminal studies establishing diagnostic criteria, pathophysiological mechanisms, or natural history data not superseded by subsequent research. Search terms included combinations of liver, hepatic, hepatitis, cirrhosis, cholestasis, eye, ocular, retina, cornea, sclera, conjunctiva, ophthalmic manifestations, and specific disease names. All study designs were eligible. Society guidelines, systematic reviews, and studies from high-impact journals were prioritized. The final selection comprised 49 references representing the most authoritative sources across the spectrum of hepatic conditions.

**Results:** A spectrum of ocular findings linked to distinct hepatic conditions was identified. Manifestations with established clinicopathologic associations were categorized into congenital and acquired etiologies. Congenital liver pathologies included metabolic disorders (Wilson disease, galactosemia, lysosomal storage disorders) and syndromic/genetic causes (Alagille syndrome, hereditary hemochromatosis). Acquired liver diseases encompassed infectious (hepatitis B/C), drug-induced and iatrogenic (interferon, immune checkpoint inhibitors), nutritional (vitamin A deficiency), neoplastic (metastatic hepatocellular carcinoma), and cirrhotic causes.

**Conclusion:** Specific ocular signs raise clinical suspicion for underlying liver disease and warrant targeted hepatic evaluation. Recognizing these associations facilitates earlier diagnosis and improves outcomes. Systematic screening for these signs is supported in at-risk populations, and prospective validation studies should establish their sensitivity and specificity.

**Keywords:** liver-eye axis; hepatic disease; ophthalmology; extrahepatic manifestations; diagnostic screening

## GP-40

**Title:** A Multivariate Transcriptomic Signature of Circadian Oscillator Decay in the Alzheimer's Disease Entorhinal Cortex

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### Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder traditionally characterized by amyloid-beta plaques and tau tangles. However, circadian and sleep disturbances are increasingly recognized as early indicators and potential drivers of neurodegeneration. While clinical evidence links circadian disruption to AD, the specific behavior of the core molecular oscillator within the vulnerable hippocampal-entorhinal system remains poorly defined. Most transcriptomic studies analyze clock genes in isolation, failing to capture the multivariate relationship between the activator and repressor limbs of the circadian machinery.

This study aimed to define a multivariate circadian signature of AD within the entorhinal cortex. We sought to quantify the imbalance between the positive limb (activators) and negative limb (repressors) of the transcription-translational-feedback-loop (TTFL), assess the loss of molecular coordination, and identify associated functional pathway disruptions.

We analyzed high-resolution transcriptomic data from the NCBI Gene Expression Omnibus (GSE278723), specifically comparing Alzheimer's Disease (n=15) and Healthy Control (n=13) cohorts from the entorhinal cortex. Differential expression analysis was performed using DESeq2 ( $p_{adj} < 0.05$ ). A panel of 12 core clock genes was analyzed for multivariate shifts using Principal Component Analysis (PCA) biplots and pairwise Spearman correlation matrices. Functional enrichment was conducted via the ReactomePA framework to identify disrupted biological processes.

We identified a massive regulatory shift involving over 11,000 differentially expressed genes. The AD entorhinal cortex exhibited a systematic repressor-heavy state, characterized by the significant downregulation of the primary activator CLOCK and the robust induction of negative feedback repressors, including PER1, PER2, PER3, NR1D1, and BHLHE41. Multivariate analysis showed a clear spatial separation of AD and HC cohorts, driven by this activator-repressor imbalance. Correlation analysis revealed a widespread loss of temporal coordination in AD, marked by a pathological hyper-synchronization of the PER2-PER3 relationship ( $r = 0.735$  in AD vs.  $r = 0.156$  in HC). These circadian failures converged with the upregulation of epithelial keratins (KRT1, KRT14) and a collapse in mRNA splicing and MHC Class I antigen processing.

Our findings demonstrate that AD is characterized by a fundamental decoupling of the molecular clock. This shift toward a repressor-dominated state likely impairs the brain's ability to maintain temporal homeostasis, exacerbating proteostatic failure and neuroinflammation. Restoring the activator-repressor balance within the molecular oscillator represents a critical therapeutic frontier for mitigating the progression of Alzheimer's disease.

**Keywords:** Alzheimer's Disease, Circadian Rhythm, Entorhinal Cortex, Transcriptomics, Molecular Clock

## GP-41

**Title:** Impact of Cigarette Smoke on Host Immune Response to Tuberculosis: A Transcriptomic Study

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**Research Sponsors:** Federal

### Abstract

**Introduction:** Tuberculosis (TB) is a major infectious disease mostly affecting the lungs and according to WHO, remains a leading cause of death from a single infectious agent, with over 10 million cases estimated in 2024. Smoking is a critical modifiable risk factor that compromises pulmonary immune defenses, facilitating the progression from latent to active TB. This study investigates the effects of Cigarette Smoke Condensate (CSC) on Bone-Marrow-Derived Macrophages (BMDMs) during Mycobacterium tuberculosis (Mtb) infection in Rhesus macaques.

**Methods:** BMDMs were treated with CSC at varying concentrations (40 µg and 80 µg) and infected with M.tb CDC1551. This study utilized bulk RNA-seq data and the RNA sequencing was performed at 24 hours post infection across three sample groups: 1) Control, 2) treated 40 µg, and 3) treated 80 µg. The bioinformatics workflow included quality control, trimming adapters followed by alignment to the Macaca mulatta reference genome (Mmul\_10), generating gene counts. Differential expression analysis was conducted using DESeq2. Reactome pathway analysis were performed using ReactomePA.

**Results:** All samples passed quality control with alignment rates between 92.19% and 95.69%. PCA analysis identified three distinct groups: control, 40 µg treatment, and 80 µg treatment. 3,162 differentially expressed genes (DEGs) in the 40-µg group and 2,22 DEGs in the 80-µg group relative to controls were identified. Reactome analysis of the 40-µg CSC-treated group revealed significant downregulation of key immune pathways, including Signaling by Interleukins (IL-10, IL-4/13) and Interferon α/β signaling and IFN-γ Interferon signaling.

**Conclusions:** Cigarette smoke impairs immune defenses, including macrophage function and cytokine response, which are crucial for controlling TB infection. These risks of delayed recovery, higher relapse, and mortality are amplified in high-smoking and low-resource populations. Integrating smoking cessation into TB care is essential to improve patient outcomes and reduce transmission and overall disease burden. Our analysis revealed significant downregulation of key immune signaling pathways, including Interleukin signaling (IL-10, IL-4/13), Interferon (IFN) α/β signaling and IFN-γ gamma signaling in TB-infected individuals with a history of smoking. Their suppression suggests a weakened innate and adaptive immune response, impaired macrophage activation, and disrupted cytokine balance. This advancement in the understanding of TB pathogenesis opens the scope for exploring additional environmental exposures and TB pathogenesis in our future works.

**Keywords:** Transcriptomics, Tuberculosis, Bioinformatics, Smoking, Immune Response

## GP-42

**Title:** Avoidance of Mitotane in Recurrent Pediatric Adrenocortical Carcinoma: A Case Demonstrating Remission with Chemotherapy Alone

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**Research Sponsors:** Not Applicable

### Abstract

**Introduction:** Adrenocortical carcinoma (ACC) is a rare and aggressive pediatric malignancy. Standard treatment often includes surgical resection alone followed by combination chemotherapy and the adrenolytic agent mitotane in recurrent cases. While mitotane is often used in adult ACC, its toxicity profile, including adrenal insufficiency, neurotoxicity, and prolonged systemic effects, poses significant challenges in pediatric patients. Limited data exists regarding the necessity of mitotane in young children with recurrent disease.

**Case Description:** We present the case of a one-year-old female diagnosed with ACC associated with a germline TP53 mutation consistent with Li-Fraumeni syndrome, an autosomal dominant cancer predisposition disorder. Following initial surgical resection, the patient experienced tumor recurrence and was treated according to a Children's Oncology Group multi-agent chemotherapy protocol for high-risk pediatric ACC. She received eight cycles of etoposide, doxorubicin, and cisplatin (EDP) without incorporation of mitotane. Treatment was complicated by anticipated chemotherapy-related toxicities, however, mitotane-associated long-term endocrine and neurologic toxicities were avoided.

**Results:** The patient achieved remission following completion of therapy. Serial imaging and ongoing surveillance evaluations have demonstrated no evidence of persistent or progressive disease. Notably, remission was achieved without exposure to mitotane, thereby avoiding its well-documented prolonged half-life and sustained adrenal suppression.

**Conclusion:** This case demonstrates that remission in select pediatric ACC patients may be achievable using standard cytotoxic backbone therapy following surgical resection, without the incorporation of mitotane. Given mitotane's substantial toxicity burden in early childhood, this case supports consideration of individualized, risk-adapted therapeutic strategies. Further investigation is warranted to clarify the role of mitotane in pediatric ACC, particularly in patients with hereditary cancer syndromes.

**Keywords:** Pediatric Adrenocortical Carcinoma (ACC), Mitotane Avoidance, EDP Chemotherapy (Etoposide-Doxorubicin-Cisplatin), Li-Fraumeni Syndrome (TP53 mutation), and Treatment De-escalation

## GP-43

**Title:** In Vitro Dihalobenzene Nephrotoxicity In Isolated Kidney Cells

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### Abstract

Bromobenzene, chlorobenzene and their derivatives are widely used industrial intermediates known to cause organ toxicity, including hepatotoxicity and nephrotoxicity. While bromo- and chlorobenzene have been studied in some detail, limited data exists on how polyhalogenation (substitution with more than one of the same halogen atom) or mixed-halogen substitution alters their toxicological profiles, particularly in the kidney. This study evaluated the in vitro nephrotoxicity of mono-, di-, and mixed di-halogenated benzenes (focusing on 1,4-dihalogen substitution) using isolated kidney cells (IKCs) from male Fischer 344 rats as the model. Compounds tested were bromobenzene, 1-bromo-4-fluorobenzene, 1-bromo-4-chlorobenzene, 1,4-dibromobemzene, 1-bromo-4-iodobenzene, chlorobenzene, 1-chloro-4-fluorobenzene, 1,4-dichlorobenzene and 1-chloro-4-iodobenzene. IKC (~4 million/ml; 3 ml) were treated with DMSO or 0.25, 0.5, and 1.0 mM of a halogenated benzene for 30 or 60 minutes under oxygenated conditions. Cytotoxicity was measured via lactate dehydrogenase (LDH) release and trypan blue exclusion assays. Nephrotoxicity was both concentration- and time-dependent, with higher toxicity observed at increased concentrations and longer exposure times. Among the brominated compounds, 1-bromo-4-chlorobenzene and 1-bromo-4-fluorobenzene were the most nephrotoxic, followed by bromobenzene, 1,4-dibromobenzene, and 1-bromo-4-iodobenzene. Within the chlorobenzene group, 1,4-dichlorobenzene induced the highest toxicity, followed by 1-bromo-4-chlorobenzene, 1-chloro-4-fluorobenzene, chlorobenzene, and 1-chloro-4-iodobenzene. These results demonstrate that the nature of the halogen substitution is a critical determinant of nephrotoxic potential of 1,4-dihalobenzenes in vitro, with addition of an iodo group producing the least toxic compound in each series. Supported in part by NIH grant P20GM103434

**Keywords:** nephrotoxicity,dihalobenzenes,SAR

## GP-44

**Title:** Exploring PRDX6 as a Therapeutic Target in the Development of Novel Medications for Cannabis and Opioid Use Disorders.

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### Abstract

Cannabis use is increasing for both medical and recreational reasons, with evidence supporting its benefits in conditions like chronic pain, chemotherapy-induced nausea, multiple sclerosis-related spasticity, sleep disorders, and HIV-associated cachexia. However, this rise is paralleled by a growing rate of cannabis use disorder (CUD), affecting about 9% of users. Treating CUD is challenging due to the lack of approved medications and the presence of cannabis withdrawal syndrome (CWS), which includes symptoms like anxiety, insomnia, irritability, low appetite, and cravings—often leading to relapse. Emerging preclinical research suggests that the antioxidant enzyme peroxiredoxin 6 (PRDX6) may play a critical role in modulating withdrawal-related responses. This project investigated the role of PRDX6 as a therapeutic target for the treatment of cannabis and opioid withdrawal disorders. Mice were made physically dependent on either morphine or  $\Delta$ 9-THC followed by induction of withdrawal with either rimonabant or naloxone. Genetic deletion of PRDX6 suppressed opioid withdrawal but had no effect on withdrawal from  $\Delta$ 9-THC. Chemical inhibition of PRDX6 with MJ-33 had no impact on THC-induced withdrawal. These data suggest that PRDX6 is not involved in cannabinoid withdrawal syndrome. However, PRDX6 does play a role in withdrawal from opioids.

**Keywords:** PRDX6, DELTA9- THC, OPIOIDS, MJ33, RIMONABANT

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