
WestVirginiaUniversity.
OFFICE OF UNDERGRADUATE RESEARCH
THE 13TH ANNUAL
SUMMER UNDERGRADUATE RESEARCH SYMPOSIUM
LAUNCHES THURSDAY, JULY 29, 2021 AT 11 A.M.
POSTER PRESENTATIONS OPEN | 11 A.M. ONWARD
ORAL PRESENTATIONS LIVE ON ZOOM | 12 P.M. - 2 P.M.
SYNCHRONOUS COMMENTING ON POSTERS | 2 - 4:30 P.M.
ENERGY
PSYC
FACT
BAA

West Virginia University.
HONORS COLLEGE

Greetings and welcome to WVU's 2021 "Virtual" Summer Undergraduate Research Symposium.

Tom Cech, past president of the Howard Hughes Medical Institute, once wrote that undergraduate research is the most inefficient teaching we do — and we need more of it.

Cech noted this because, while it is inefficient, this sort of engaged scholarship, whether research, creative activity or other scholarly work, is also the most transformative for the individual student. I am confident that the experiences of the undergraduates whose work we appreciate here today have been just as impactful. Personally, I, too, can attest that my experiences as an undergraduate researcher altered the whole trajectory of my career.

To the undergraduate students who have performed the work as part of this symposium, congratulations. Congratulations for staying the course to bring your respective projects to this point. Congratulations on seizing the opportunity to do more, on challenging yourself to perform at a higher level. Congratulations also for managing your time, and yourself, at a higher level.

And while it is you and your work that we celebrate today, this work did not happen in a vacuum. I want to express my sincere appreciation to the people who have mentored our undergraduate scholars. This may have been another undergraduate student, a graduate student, a post-doctoral associate, a staff member or even a faculty member. Regardless of your title, thank you for taking the time to mentor these students. I hope and am trusting that our mentors found this work equally rewarding.

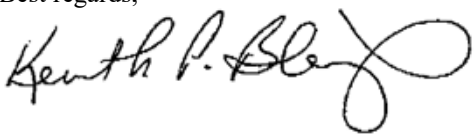
Scholarly work is challenging by nature. Those engaged in such work usually have a support network beyond their respective mentors that is key to their emotional and mental well-being, which is so critical in advancing their work. These support networks often include parents, grandparents, guardians, spouses, partners, advisors, siblings and other friends. To those in such networks, thank you for the important role you played in advancing the work we celebrate today.

The work showcased in this symposium is underwritten by several different funding sources; chief among them is WVU SURE funding. The SURE program is directed by Dr. Michelle Richards-Babb and co-director Dr. Rita Rio with assistance from three graduate teaching assistants: Morgan Simpson, Sarah Lempka and Emily Heller. A special thanks to these folks for all their work this summer making the SURE program such a success. Other organizations have underwritten individual projects, and you can see those organizations in this volume. I am very grateful for all the funding sources but would especially like to acknowledge the funding from the Research Experience for Undergraduates (REU) programs, the Louis Stokes Alliance for Minority Participation (LSAMP), various research fellowships and internships, and especially the support to our Beckman Scholars.

The Office of Undergraduate Research is responsible for facilitating this symposium. The Office is directed by Dr. Michelle Richards-Babb and co-director Dr. Cinthia Pacheco with assistance from program coordinators Paige Zalman and Kevin Walden. I appreciate the great work of this office in putting this symposium together, but also more broadly for advancing undergraduate research at West Virginia University. In particular, I would like to acknowledge, congratulate, and thank Dr. Michelle Richards-Babb, the founding director of the Office of Undergraduate Research, for her outstanding work growing the undergraduate research enterprise at WVU.

Well done all.

Best regards,



Kenneth P. Blemings, PhD Professor of
Nutritional Biochemistry
Dean of the WVU Honors College

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Thursday July 29, 2021 https://undergraduateresearchsymposia.wvu.edu

# I. Approximate Schedule of Events

| | |
|---|---|
| **Thursday July 29, 2021** | |
| 11:00 am onward | Symposium Opens-Presentations available from 11:00am onward and for a minimum of one week. *All welcome: parents, research mentors, graduate and undergraduate students (current and incoming), and members of the public.* |
| 11:00 am-2:00 pm | Presentation Judging- Judging of presentations-all categories. |
| 12:00 pm-2:00 pm | Oral Presentations- Oral presentations available synchronously in Zoom. |
| 2:00 pm-4:30 pm | Synchronous Commenting- Poster presenters will monitor and respond to questions and comments posted within their YouTube presentations in real-time. Judges ask questions and evaluate responses. |
| **Friday July 30** | Awards Announced- Top presenters in each presentation category will be posted on the Symposium website. |

# III. Poster Judges

**Oral Presentations**
Eduardo Sosa
I-Chung Chen
James Siekmeier
Janelle Chuah
Julie Hicks Patrick
Morgan McMinn
Tom Cuchta
Xufeng Zhang
Youyoun Moon

**Poster Presentations**
Anna Korol
Bhanukiran Gurijala
Carinna Ferguson
Carly Amato-Menker
César Catellon Gort
David Sokolov
Deniz Talan
Duncan Lorimer
Emel Kangi
Emily Ryan
Erica Maney
Eugen L Nagy
Ganesh Ghimire
Gulnara Zaynutdinova
Hasan El Rifai
Heather Chaney
Hecmarie Melendez-Fernandez
Jacob Bumgarner
Jessica Towey
Jiangmei Yuan
Joseph Melott

**Poster Presentations (cont.)**
Kathrine Curtin
Katya Nolder
Leland Earp
Lyn Yuen, Choo
Madison White
Mark Timmons
Mason Lee
Matthew Keaton
Megan McDougal
Michael Jones
Michaela Campbell
Mohamed Hef

*We want to take this opportunity to thank our presentation judges. Their willingness to act as judges for this event is appreciated by the organizers and participants!*

* Human Engagement includes research and scholarship pertaining to how humans interact and engage within society in the areas of business, education, creative arts, and humanities.

# II. Oral Presentation Schedule

Zoom Link:
https://wvu.zoom.us/j/91888342745?pwd=MG9DbUhmR2ttUTRpeFlndms2ZGxZZz09
Meeting ID: 918 8834 2745; Passcode: Th66f97j

| Present. No. | Assigned Category | Zoom Room No. | Presentation Time | Presenter Name |
|---|---|---|---|---|
| **1** | Agricultural & Environmental Sciences | 1 | 12:00-12:15 PM (EST) | Hosanna Barrett |
| **2** | Agricultural & Environmental Sciences | 1 | 12:15-12:30 PM (EST) | Charles Becher |
| **3** | Agricultural & Environmental Sciences | 1 | 12:30-12:45 PM (EST) | Shelby Collins |
| **4** | Agricultural & Environmental Sciences | 1 | 12:45-1:00 PM (EST) | Teagan Kuzniar |
| **5** | Agricultural & Environmental Sciences | 1 | 1:00-1:15 PM (EST) | Bennington Opdahl |
| **6** | Biological & Health Sciences | 2 | 12:00-12:15 PM (EST) | Emily Adis |
| **7** | Biological & Health Sciences | 2 | 12:15-12:30 PM (EST) | Kendyl Berry |
| **8** | Biological & Health Sciences | 2 | 12:30-12:45 PM (EST) | Kelcie Britton |
| **9** | Biological & Health Sciences | 2 | 12:45-1:00 PM (EST) | James Lamp |
| **10** | Biological & Health Sciences | 2 | 1:00-1:15 PM (EST) | Meghashri Saravanan |
| **11** | Biological & Health Sciences | 2 | 1:15-1:30 PM (EST) | Anthony Siler |
| **12** | Biological & Health Sciences | 2 | 1:30-1:45 PM (EST) | Jessica Underwood |
| **13** | Human Engagement | 3 | 12:00-12:15 PM (EST) | Yaronn James Arciaga |
| **14** | Human Engagement | 3 | 12:15-12:30 PM (EST) | Sarah Francis |
| **15** | Human Engagement | 3 | 12:30-12:45 PM (EST) | Giana Loretta |
| **16** | Human Engagement | 3 | 12:45-1:00 PM (EST) | Elizabeth Rockwell |
| **17** | Human Engagement | 3 | 1:00-1:15 PM (EST) | Falon Snodgrass |
| **18** | Physical Sciences & Engineering | 4 | 12:00-12:15 PM (EST) | Jackie Arnold |
| **19** | Physical Sciences & Engineering | 4 | 12:15-12:30 PM (EST) | Kelby Palencia-Torres |
| **20** | Physical Sciences & Engineering | 4 | 12:30-12:45 PM (EST) | Spencer Regnier |
| **21** | Physical Sciences & Engineering | 4 | 12:45-1:00 PM (EST) | Sparrow Roch |
| **22** | Physical Sciences & Engineering | 4 | 1:00-1:15 PM (EST) | Trevor Smith |
| **23** | Physical Sciences & Engineering | 4 | 1:15-1:30 PM (EST) | Jonathan Wimer |

# III. Undergraduate Presenters and Faculty Research Mentors

***We want to take this opportunity to thank our undergraduate presenters. These students' willingness to present and discuss their scholarly activities in virtual format is appreciated.***

***In addition, special thanks to our faculty research mentors. Scholarly activities, such as research and creative endeavors, enrich the academic training of our students by establishing mentoring relationships and promoting intellectual independence and curiosity. Our students are indebted to the faculty who mentor them in research!***

## A. Agricultural & Environmental Sciences (Oral Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Hosanna Barrett | 1 | Biology | Matt Kasson | Conoideocrella luteorostrata, a Potential Biocontrol of Elongate Hemlock Scale in the Eastern United States | WVU SURE |
| Charles Becher | 2 | Animal and Nutritional Sciences | Scott Bowdridge | Data from the WVU buck performance test is used to make genetic herd improvements | WVU SURE |
| Shelby Collins | 3 | Biology | Ibukun Ogunade | Effects of Yucca schidigera Plant Extract on Whole Blood Chemistry of Dairy Heifers | WVU SURE |
| Teagan Kuzniar | 4 | Environmental Microbiology | Ember Morrissey | Temperature, Oxygen, and Vegetation as Drivers of Microbial Dynamics in Warming Boreal Peatlands | WVU SURE |

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|---|---|---|---|---|---|
| Bennington Opdahl | 5 | Chemistry | Shikha Sharma | Rare earth elements association in inorganic and organic fractions of Appalachian coals and shales | WVU SURE |

## B. Biological & Health Sciences (Oral Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Emily Adis | 6 | Biochemistry | Jianhai Du | Tracing Retinal Metabolism Through Intravitreal Injection of Labeled Glucose | WVU Vision Research Fellowship Program |
| Kendyl Berry | 7 | Immunology and Medical Microbiology | John Barnett | Inhibition of Mycobacterium tuberculosis Induced Bone Erosion by the Novel Compound ELP-004 | WVU IMMB Undergraduate Research Internship |
| Kelcie Britton | 8 | Immunology and Medical Microbiology | Daniel Panaccione | Identification of a Gene Involved in Production of Pharmaceutically Important Lysergic Acid Amides | WVU Beckman Scholars Program |
| James Lamp | 9 | Neuroscience | Vincent Setola | Monoamine transporters show decreased uptake with delta and kappa opioid receptors | WVU SURE |
| Meghashri Saravanan | 10 | Biology | Jianhai Du | Gender Differences in Eye Metabolism in Fed and Fasted Mice | WVU Vision Research Fellowship Program |
| Anthony Siler | 11 | Biology | Saravanan Kolandaivelu | NMNAT1, A Protein Linked With Blinding Diseases Is Post-Translationally Lipid Modified By Protein Palmitoylation | WVU Vision Research Fellowship Program |
| Jessica Underwood | 12 | Chemistry | Vincent Setola | Regulator of G protein Signaling-12 (RGS12) in Dopamine and Seretonin Homeostasis and Synaptic Clearance | Honors EXCEL |

## C. Human Engagement (Oral Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Yaronn James Arciaga | 13 | Mathematics | Vicki Sealey | Perspective on Mastery-Based Grading | NSF LSAMP & WVU SURE |
| Sarah Francis | 14 | Psychology | Amy Gentzler | Relationship Between Parent-Child Relationships and Adolescent Depressive Symptoms | WVU SURE |
| Giana Loretta | 15 | Political Science*, Philosophy, Communication Studies | Herschel Thomas | Understanding Texas's Response to the Compounding Crises of Winter Storm Uri and COVID-19 | WVU SURE |
| Elizabeth Rockwell | 16 | Women's and Gender Studies; Music | Michael Vercelli | The legacy of Bernard Woma: a resource for independent study of Dagara gyil | WVU SURE |
| Falon Snodgrass | 17 | French and International Studies | Matthew Vester | Land Access in the Italian Alps and How it Influenced Relationships in Premodern Societies | WVU SURE |

## D. Physical Sciences & Engineering (Oral Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Jackie Arnold | 18 | Chemical Engineering | Cerasela Dinu | Enzyme Immobilization within a Hyaluronic Acid Matrix for Biosensor Applications | WVU Beckman Scholars Program |
| Kelby Palencia-Torres | 19 | Physics | D.J Pisano | Mapping Neutral Hydrogen from M31's Circumgalactic Medium | WVU Astrophysics REU |

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|---|---|---|---|---|---|
| Spencer Regnier | 20 | Mechanical Engieering | Yu Gu | A Novel Solution to Inertial Measurement Unit (IMU) Location Drift During Long Distance Traversal | NSF LSAMP & WVU SURE |
| Sparrow Roch | 21 | Physics, Computer Science | Maura McLaughlin | Gravitational Wave Detection with Pulsars | Astrophysics IRES |
| Trevor Smith | 22 | Mechanical and Aerospace Engineering | Yu Gu | Active Cooperative Localization of Swarm Robots using Adaptive Boid's Rules | WVU Robootics REU |
| Jonathan Wimer | 23 | Mechanical Engineering | Patrick Browning | STEM Outreach through Drone Technology | Honors Excel Program |

## E. Agricultural & Environmental Sciences (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| William Brown | 24 | Reagents Degree | Brenden McNeil | How Does the Decline in Summer Greenness Differ by Tree Species? | WVU Geography REU & WVU SURE |
| Ethan Cade | 25 | Environmental Geoscience | Brenden McNeil | How Are AM Mycorrhizal and EM Mycorrhizal Tree Species Dispersed in Appalachian Forests? | WVU SURE |
| Peyton Caylor | 26 | Wildlife and Fisheries Resources Management | Christopher Rota | Application of Geolocators on Canada Warblers (Cardellina canadensis) and Their Effect on Survival Probability | WVU SURE |
| Emily Duckworth | 27 | Biochemistry | Vagner Benedito | Deconvoluting the sesquiterpenoid biochemical pathway of Artemisia annua | WVU SURE |
| Rachel Gadd | 28 | Biochemistry | Matthew Kasson | Survey of Verticillium spp. occurring on Ailanthus in West Virginia as biological control agents | WVU SURE |

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|---|---|---|---|---|---|
| John Holden IV | 29 | Forest Resources Management | Sophan Chhin | Establishing Optimal Forest Density for Growth of California Black Oak Within the Sierra Nevada | WVU SURE |
| Savannah Mead | 30 | Horticulture | Nicole Waterland | Horticultural performance of ethylene-insensitive etr1-1 petunias | WVU SURE |
| Zachary Moats | 31 | Environmental Microbiology | Louis McDonald | Efficiency of Lead-Cadmium Metal Uptake in Cannabis Sativa L. | WVU SURE |
| Lily Neilsen | 32 | Environmental Science and Political Science | James Kotcon | Evaluation of urea amendments in microbiological media to quantify nematode trapping fungi | WVU SURE |
| Lydia Nicolai | 33 | Environmental Geoscience | Brenden McNeil | Effects of Water Deficit on the Growth of Appalachian Tree Species | WVU Geography REU & WVU SURE |
| Kelsey Razvillas | 34 | Forest Resource Management | Kirsten Stephan | Repeatedly Harvesting Narrow Strips of Forest for Energy Biomass Benefits the Herbaceous Layer | WVU Davis College |
| Marshall Robinson | 35 | Environmental Microbiology | Ember Morrissey | Effects of Soil Transplant and Fertilization on Arbuscular Mycorrhizal Fungi Colonization in Miscanthus | WVU SURE |
| Mathias Solliday | 36 | Horticulture | Nicole Waterland | Irrigation timing affects plant growth and mineral nutrient concentration in coleus and kale. | WVU SURE |
| Isabel Weeks | 37 | Biochemistry | Youyoun Moon | Far-red LED light treatment increased shoot height and diminished root capacity in kale | NSF LSAMP & WVU SURE |

# F. Biological Sciences (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Emmelia Braun | 38 | Biology | Jennifer Hawkins | Morphological and physiological variations associated with reproductive and vegetative salinity tolerance in Sorghum | WVU SURE |
| Michael DiBacco | 39 | Biology and English | Jennifer Gallagher | Saccharomyces cerevisiae chromosomal stability in sgs1 and sir1, cac1 mutants | WVU SURE |
| Joshua Ferrar | 40 | Biochemistry | Brandon Choi | Conformational Changes of Syntaxin-3B in Regulating SNARE Complex Assembly | WVU SURE |
| Hanna Jandrain | 41 | Biochemistry | Werner Geldenhuys | Analyzing MitoNEET Protection Against Paraquat-induced Oxidative Stress in C. Elegans Aging Models | WVU SURE |
| Abigail Jones | 42 | Biochemistry | Daniel Panaccione | Independent evolution of a lysergic acid amide in Aspergillus species | WVU Beckman Scholars Program |
| Shelby Meador | 43 | Biology | Matt Kasson | Biodiversity of Fungi Associated with American Fungus-Feeding Millipedes | WVU SURE |
| Maeve Morris | 44 | Immunology and Medical Microbiology | Jennifer Franko | Screening Potential Endocrine Disrupting Compounds and their Impacts on Glucocorticoid Signaling | WVU IMMB Undergraduate Research Internship |
| Rachel Morris | 45 | Biology | Rita Rio | From Here to There: Transporter Expression through Tsetse Fly Development | WVU SURE<br>KY-WV LSAMP, Henry W. Hurlbutt Memorial Research Award |
| Brady Nicewarner | 46 | Animal and Nutritional Sciences | Jianbo Yao | Cloning of Bovine Agouti-Signaling Protein into pcDNA3.1/myc-HisA | WVU SURE |
| Anna Phillips | 47 | Biomedical Engineering | Paul Chantler | Chronic Stress Initiates Superoxide Production in the Liver of C57BL/6J Mice | WVU SURE |
| Matthew Rexroad | 48 | Biochemistry | David Smith | Identifying Proteasome Activators for Neurodegeneration | WVU SURE |
| Rhett White | 49 | Biology | Randy Nelson | The Effects of Dim Light at Night on Morphine Induced Analgesia | WVU SURE |

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| Michael Willis | 50 | IMMB | Jennifer Franko | Culturing Gastric Organoids for Microinjection of Helicobacter pylori | WVU IMMB Undergraduate Research Internship |

## G. Engineering (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Matthew Barre | 51 | Mechanical Engineering, Aerospace Engineering | Edward Sabolsky | Nano-Cu Decorated Polylactic Acid Nanofibers Produced by Centrifugal Force-spinning for Reusable Antimicrobial Respirator Filters | WVU SURE |
| Alexander Brun | 52 | Civil and Environmental Engineering | Emily Garner | Wastewater-based Epidemiology a Tool to Track Community Spread of SARS-CoV-2 | WVU SURE |
| Hunter Cottrill | 53 | Biomedical Engineering | Jessica Allen | Using Reflective Tape to Measure Treadmill Speed and Detect Perturbations with Infrared Motion-capture Cameras | WVU SURE |
| Cristian Cuevas-Mora | 54 | Mathematics | Marjorie Darrah | Implementation of a Convolutional Neural Network for Object Classification | NSF LSAMP & WVU SURE |
| Vinicius Ferreira | 55 | Aerospace Engineering | Guilherme Pereira | Drone Control Using Pixhawk and ROS | My efforts were mainly voluntary. |
| Chase Holley | 56 | Mechanical and Aerospace Engineering | Jignesh Solanki | Applying artificial intelligent code to detect disturbances within power grid systems | WVU SURE |
| Morgan Holzman | 57 | Mechanical Engineering | Jignesh Solanki | Using Artificial Intelligence To Detect Oscillations In Power Grids | WVU SURE |
| Raimah Hossain | 58 | Biomedical Engineering | Lian-Shin Lin | Using Anaerobic Ammonium Oxidation Coupled to Ferric Reduction (Feammox Bacteria) to Treat Domestic Wastewater | WVU SURE |
| Stephen Jacobs | 59 | Mechanical and Aerospace Engineering | Guilherme Pereira | A Framework for Controlling Robotic Swarms Using Bayesian Optimization and Linear Combination of Vectors | WVU Robootics REU |

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|---|---|---|---|---|---|
| Antonio Mascaro | 60 | Chemical Engineering | Fernando Lima | Modeling and Designing Polyimide-Derived Carbon Molecular Sieve Membranes for Carbon Capture from Flue Gas | WVU SURE |
| Ashley McCullough | 61 | Chemical Engineering | Fernando Lima | Renewable Energy Data Mapping and Integration for the PJM Region | WVU SURE |
| Nathaniel Pearson | 62 | Computer Engineering | Yu Gu | Free Market Economies as a Model for Robotic Swarm Foraging | WVU Robootics REU |
| Thomas Prince | 63 | Petroleum and Natural Gas Engineering | Samuel Ameri | Varying Fracture Properties to Achieve Maximum Recovery of Natural Gas From Shale | WVU SURE |
| Alexander Pueschel | 64 | Biomedical Engineering | Margaret Bennewitz | Elucidating tumor cell interactions with Cy5 in microfluidic tumor models using fluorescence microscopy | WVU SURE |
| Alyssa Reeves | 65 | Biomedical Engineering | Jessica Allen | Differences in Reactive Muscle Recruitment Between Standing and Sit-to-Stand Perturbations | WVU SURE |
| David Rubel | 66 | Mathematics and Computer Science Dual Degree | Guilherme Pereira | Collision-Free Navigation of Robotic Swarms using Preferred Velocity Metrics and Time Prioritized Avoidance | WVU Robootics REU |
| Reese Steindler | 67 | Mechanical and Aerospace Engineering | Edward Sabolsky | Evaluation of the effectiveness of hydrophobic coatings on ionic polymer–metal composite electronics | WVU SURE |
| Karen Truong | 68 | Management Information Systems | Janet Fraser | Language on twitter: women in stem versus non-stem | WVU SURE |
| Daniel Villarreal | 69 | Aerospace Engineering | Yu Gu | External Interference on Autonomous Robotic Swarm | WVU Robootics REU |
| Dillan Wilson | 70 | Mechanical Engineering | Yu Gu | Decentralized Robotic Foraging Through Local Interactions | WVU Robootics REU |

# H. Health Sciences (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Emily Airing | 71 | Immunology and Medical Microbiology | Mariette Barbier | Regional Surveillance of Pseudomonas aeruginosa Epidemiology in Monongalia County, WV | WVU IMMB Undergraduate Research Internship |
| Jessica Amedro | 72 | Immunology and Medical Microbiology | Salik Hussain | A realistic co-exposure scenario induces significantly high inflammation in lungs in NLRX1 dependent manner | WVU IMMB Undergraduate Research Internship |
| Abigail Baker | 73 | Biomedical Engineering | Scott Galster | The Effects of Wet Versus Dry Float on Heart Rate Variability | WVU SURE |
| Brooke Brothers | 74 | Immunology and Medical Microbiology | Ivan Martinez | Expression of the Y chromosome-encoded linc-SPRY3-2/3/4 increases after radiation in multiple cancer types. | WVU SURE |
| Chloe Chipman | 75 | Immunology and Medical Microbiology | Slawomir Lukomski | emm Types and Macrolide Resistance among Invasive Group A Streptococcus in West Virginia | WVU IMMB Undergraduate Research Internship |
| Caitlin Cowell | 76 | Integrative Biology | Elena Pugacheva | Characterization of Stemness and Ciliation in Patient-Derived Glioblastoma Samples | WVU Cancer Research Fellowship Program |
| Megan Garris | 77 | Chemistry and Biology | Mark McLaughlin | Targeting Immune Checkpoint Inhibitors to Cell-Surface Markers on Tumors | WVU SURE |
| Taylor Guidry | 78 | Immunology and Medical Microbiology | Jonothan Boyd | Analysis of two routes of exposure of DFP to determine tissue cellular response | WVU SURE |
| Brice Johnston | 79 | Immunology and Medical Microbiology | Meenal Elliott | Testing the antimicrobial properties of Bio-nano-composite PLA nanofibrils electrospun with copper nanoparticles. | WVU IMMB Undergraduate Research Internship |
| Riley Kane | 80 | Biochemistry | Werner Geldenhuys | Synthesis and Purification of Novel mitoNEET Ligands, Therapeutic Potential for Neurodegenerative Diseases | WVU SURE |

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| Matthew Kays | 81 | Immunology and Medical Microbiology | Cory Robinson | DNA Methylation of IL-27α: A Target for Neonatal Sepsis Treatment | WVU IMMB Undergraduate Research Internship |
| Emily Lecea | 82 | Immunology and Medical Microbiology | Gangqing Hu | Transcription signature of CD138low/- Multiple Myeloma Cells | WVU IMMB Undergraduate Research Internship |
| Ashley Linder | 83 | Biomedical Engineering | Brianna Sheppard | Accountable Health Communities Model Evaluation and Gap Analysis in West Virginia | WVU SURE<br>Centers for Medicare & Medicaid Services; WV Clinical and Translational Science Institute |
| Linda ` Ma | 84 | Immunology and Medical Microbiology | Edwin Wan | The Protective Role of Monocytes in Stroke-Associated Pneumonia | WVU IMMB Undergraduate Research Internship |
| Jason Plants | 85 | Exercise Physiology | Sergiy Yakovenko | Passive Stride-length Limiting Orthosis Causes Gait Asymmetry and Sensorimotor Adaptation in Humans. | WVU SURE |
| Lillie Powell | 86 | Immunology and Medical Microbiology | Slawomir Lukomski | Emergence of Erythromycin Resistant emm92 Invasive Group A Streptococcus in West Virginia | WVU IMMB Undergraduate Research Internship |
| Madison Robinson | 87 | Exercise Physiology | Mark Olfert | Single vape exposure on middle cerebral artery function over a 72-hour period | NSF LSAMP & WVU SURE |
| Sabrina Siegan | 88 | Immunology and Medical Microbiology | Jennifer Franko | Sex Hormones, Sex Chromosomes, and Microbiome Interactions Influence Humoral Immune Responses to HKSP Immunizations | WVU IMMB Undergraduate Research Internship |
| Jamie Smith | 89 | Biology | H. Wayne Lambert | Additional Examples of the Rare Anterior Fibulocalcaneus Muscle | NSF LSAMP & WVU SURE |
| Andrew Strutz | 90 | Music Performance (B.M.), Biology (B.A.) | Candice Brown | Deletion of Tissue-Nonspecific Alkaline Phosphatase on Endothelial Cells Exacerbates Sepsis-Mediated Intestinal Hyperpermeability | My efforts were mainly voluntary. |

# I. Neuroscience (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Samuel Francis | 91 | Biology (B.S.) | Andrew Dacks | Odor Sensitivity Effects in 5-HT1A Receptor Knock-down in Vinegar Fly Local Interneurons | WVU SURE |
| Karissa Gautier | 92 | Neuroscience | Kathleen Morrison | Examining the effect of stress during puberty and pregnancy-related hormones on the PVN transcriptome | WVU SURE |
| Chloe Hernandez | 93 | Neuroscience and Psychology | Candice Brown | Optimization of Multiphoton Imaging for Quantification of Cerebral Microvessel Permeability in Murine Ischemic Stroke | Louis Stokes STEM Pathways and Research Alliance: KY-WV LSAMP |
| Evan McCray | 94 | Exercise Physiology | Randy Nelson | Circadian disruption effects on vascularization in the hippocampus following cardiac arrest | WVU SURE |
| Benjamin Menarchek | 95 | Biology | Vincent Setola | Characterizing Opioid Receptor Modulation of Monoamine Transporters: A Potential Avenue for Treating Neuropsychiatric Diseases | Neuroscience/Vincent Setola & WVU SURE |
| John Mendoza | 96 | Neuroscience | Kathleen Morrison | The Impact of Stress During Puberty on the Developing Hypothalamus | NSF LSAMP & WVU SURE |
| Victoria Parello | 97 | Biomedical Engineering | Sergiy Yakovenko | Comparing Spiking Neural Networks to Rate Models in Biological Computations | WVU SURE |
| Eva Stanley | 98 | Biology B.S. | Charles Anderson | The Role of Zinc Transporters in Brain Function | WVU MD/PhD Summer Research Internship Program |

# J. Physical Sciences (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Supporting Program/Mechanism |
|---|---|---|---|---|---|
| Victoria Blanton | 99 | Astrophysics | D.J. Pisano | Testing the Effectiveness of the DSPIRA Radio Telescope for Public Use | WVU SURE |
| Carter Boger | 100 | Biochemistry | Jessica Hoover | Site-selective C-5 trifluoromethylation of N-8-quinolinyl benzamide using a nickel catalyst | WVU SURE |
| Colton Diges | 101 | Forensic Chemistry | Tatiana Trejos | Microfiber Alignment in Stamp Edges for Physical Fit Comparisons | WVU SURE |
| Olivia Duffett | 102 | Forensic Chemistry | Tatiana Trejos | Survey of Glass and Paint in the General Population to Assess their Evidential Value | My efforts were mainly voluntary. |
| Rachel Hankin | 103 | Chemistry; Molecular Biology | Justin Legleiter | The Role of Electrostatics on Huntingtin Oligomer Membrane Binding: Implications for Huntington's Disease | WVU Chemistry REU |
| Alexandra Higley | 104 | Physics and Astronomy | Maura McLaughlin | The Effect of Observatory Localization in Pulsar Timing Searches for Gravitational Waves | Astrophysics IRES |
| Kendra Kelly | 105 | Forensic Chemistry | Colby Ott | Identification of Hydroxyzine hydrochloride Utilizing Electrochemistry and Time-Resolve Raman Spectroelectrochemistry On Screen-Printed Electrodes. | |
| Jessica Kernaghan | 106 | Chemistry | Jessica Hoover | Nickel Mediated Decarbonylation of Phthalimides | WVU Chemistry REU |

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|---|---|---|---|---|---|
| Jacob King | 107 | Chemistry | Glen Jackson | Multivariate Analysis of Variance to Identify Instrumental Parameters Affecting Tandem Mass Spectra Reproducibility | WVU Chemistry REU |
| Riley Owens | 108 | Astrophysics, Physics | Loren Anderson | Ionized Gas in Cygnus X | WVU Astrophysics REU |
| Susie Paine | 109 | Physics with Astronomy | Duncan Lorimer | Finding New Radio Pulse Candidates With GREENBURST | WVU Astrophysics REU |
| Alexis Ravenscroft | 110 | Chemistry | Brian Popp | Catalytic and medicinal chemistry of novel boron-fluorine functionalized drug-like molecules | WVU SURE |
| Declan Revenew | 111 | Forensic Chemistry | Tatiana Trejos | Evaluating GC-MS and LC-MS Efficacy for Characterization of a Developed Organic Gunshot Residue Standard | |
| Amanda Reynolds | 112 | Chemistry; Mathematics | Brian Dolinar | Transition Metal-Lanthanide Bonded Single Molecule Magnets Featuring High Spin Transition Metal Centers | WVU Chemistry REU |
| Jacob Smothers | 113 | Chemistry, Biology | Jessica Hoover | Nickel-Catalyzed Nitration of 8-Benzamidoquinoline | WVU SURE |
| Jordan Stanley | 114 | Physics | Duncan Lorimer | Searching for Fast Radio Bursts in Messier 82 | WVU Astrophysics REU |
| Caitlin Thebeault | 115 | Chemistry | Gregory Dudley | Synthesis of Illudalic Acid and Inhibition Activity of LAR Subfamily | WVU Chemistry REU |
| Nathaniel Wesnak | 116 | Physics | Aldo Romero | Predicting Low Energy and Stable Spherical Allotropes of Transition Metals by Metaheuristic Methods | WVU SURE |
| Katherine Zine | 117 | Astronomy and Astrophysics | Maura McLaughlin | A Quicklook Notebook for Analysis of NANOGrav Pulsar Data | WVU Astrophysics REU |

# K. Social & Behavioral Sciences (Poster Presentations)

| Presenter Name | No. | Major | Faculty Research Mentor | Presentation Title | Program/mechanism supporting research/creative efforts |
|---|---|---|---|---|---|
| Myra Arnold | 118 | Hospitality and Tourism Management, Anthropology | Cerasela Dinu | Raising awareness about catalysis through public outreach digital platform | Other<br>Cerasela Zoica Dinu & WVU SURE |
| Lauren Browning | 119 | Psychology | Cheryl McNeil | Investigating the Reliability of the Dyadic Emotion Coding System (DECS) | WVU SURE |
| Grant DuVall | 120 | Biology | Grant DuVall | Exploration of Cognitive Impairment Variability in Patients with Opioid Use Disorder | WVU SURE |
| Sarah Ihlenfeld | 121 | International Studies and Economics | Christina Fattore | American Exceptionalism After 9/11: Dominant Narratives in Foreign and National Security Policy | WVU SURE |
| Jordan Murray | 122 | International Studies and Political Science | Boris Barkanov | Russia's Foreign Policy: The Role of Ideology | WVU SURE |
| Adrianna Pierson | 123 | Psychology | Kristin Moilanen | The Impact of Non-Volitional Sexual Interaction on Sexual Agency in Adolescent Women | WVU SURE |
| Ashley Sheree | 124 | Sociology and Women's and Gender Studies | Katie Corcoran | Women in Community Engagement: Do Higher-Earners Have Stronger Perceptions of Community Involvement? | WVU SURE |

## V. *Financial Support*

**Chemistry REU (PI: Brian Popp, co-PI: Michelle Richards-Babb)** National Science Foundation (NSF) Division of Chemistry (CHE 1852369) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.

**Robotics REU (PI: Yu Gu, co-PI: Jason Gross)** National Science Foundation (NSF) Division of Computer Science and Engineering (CSE-1851515).

**WVU SURE (PI: Michelle Richards-Babb; Co-PI: Rita Rio)** Sponsored in part by (i) the West Virginia Research Challenge Fund through a grant from the Division of Science and Research, HEPC, (ii) WVU Office of the Provost, and (iii) the Davis College of Agriculture, Forestry and Consumer Sciences, Eberly College of Arts and Sciences, the Statler College of Engineering and Mineral Resources, the College of Business and Economics, the Health Sciences Center, the Colleges of Creative Arts and Education and Human Services, and the Departments of Chemistry and Biology.

**Immunology and Medical Microbiology Research Internships (Coord: John Barnett and Rosana Schafer)** Financial support for the internships comes from the Department of Microbiology, Immunology and Cell Biology

**WVU Cancer Institute Summer Undergraduate Research Program (Coord: Alexey Ivanov)** Financial support for the fellowship program comes from the Edwin C. Spurlock Fellowship Fund, the Edward L. Reed Cancer Research Endowment, the Dr. David B. McClung Cancer Research Endowment Fund, and the Joe Marconi Cancer Research Fellowship Endowment.

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**Beckman Scholars Program (Director: Michelle Richards-Babb)** Funding provided by the Arnold and Mabel Beckman Foundation.

**Summer Undergraduate Vision Research Fellowship (PI: Jianhai Du)** Funded by the WVU Health Sciences Center Research and Graduate Education and the Department of Ophthalmology.

**Astrophysics REU (PI: Loren Anderson)** National Science Foundation (NSF) Division of Physics & Astronomy (AST 1950617)

**Geography REU (PI: Brenden McNeil, supporting William Brown and Lydia Nicolai)** National Science Foundation Division of Environmental Biology, Macrosystems Biology and NEON Enabled Science Program Grant #2106080, with additional support from the Appalachian Stewardship Foundation, and the Summit Bechtel Reserve.

**V. Speakers at WVU's Summer Undergraduate Research Experience (SURE) Events**

| Event Title | Presenter(s) |
|---|---|
| Introduction to Search Engines Used in Disciplinary Research | Subject Librarians and specialties: **Virginia Desouky** (Health Sciences: Ex Phys, IMMB)**, Martin Dunlap** (Engineering)**, Beth Royall** (Engineering)**, Barbara Hengemihle** (Davis College)**, Jessica VanderHoff** (Business)**, Jeffrey Werst** (STEM)**, Alyssa Wright** (Social Sciences)**, Lynn Stahl** (Women & Gender Studies, English) |
| Resumes, Cover letters and Elevator Pitch, and Interviewing Skills- Perform Under Pressure | **Robert Baricelli**, (Career Development Specialist, Career Services Center, WVU) |
| References/Citation manager, Endnote or Zotero | **Jeff Werst, Lynne Stahl and Jenn Monnin** (Subject Librarians, WVU) |
| Graduate Life: The Real Story | **Afsoon Sabet**<br>**Fhallon Ware-Gilmore,**<br>**Zach Donnellan,**<br>**Lauretta Werner,**<br>**Olivia Wertz** |
| Roadmap to Resiliency & the Importance of Mental Health Pt. I and II | **Layne Hitchcock, Seth Hazel, Felicia Hooper, Jeneice Shaw** (Carruth Center for Psychological and Psychiatric Services) |
| Writing Personal Statements- Telling Your Story to Funders and Admission Committees | **Amy Cyphert** (ASPIRE Office, WVU) |
| Basic Python Training Pt. I and II | **Nicolas Frazee** (WVU Research Office) |
| Scholarships: Rhodes, Schwarzman, Fulbright and Gilman | **Cate Johnson** (ASPIRE Office, WVU) |
| Humanities/Arts Career Mentoring Panel | **Wenda Harris** (Secondary Education, Education Technologist for Scholastic, Houghton Mifflin Harcourt),<br>**Matthew Jackfert** (West Virginia Public Broadcasting),<br>**Ernie Roby** (Lead technical artist for Continuum, Visual Designer for Experiments at the Dept. of Linguistics, Arctic University, Tromso, Norway),<br>**Amy Swan** (Smithsonian Institution, Hirshhorn Museum and Sculpture Garden) |
| R Training, Pt. I and Pt. II | **Vivian Guetler** (WVU Research Office) |

| | |
|---|---|
| STEM Career Mentoring Panel | **Trevor Rudy** (Associate Director of Engineering, Pratt and Whitney),<br><br>**Brittany Witherspoon** (Scientist-Discovery Chemistry),<br>**Stephen Raso** (Deputy Chief Toxicologist, Forensic Toxicology Department, Office of the Chief Medical Examiner) |
| Scholarships: NSF, Goldwater, Udall | **Eric Myers** (ASPIRE Office, WVU) |
| Creating an Effective Research Presentation | **Michelle Richards-Babb** (Director, WVU Office of Undergraduate Research) |
| How to Efficiently Read Research Papers | **Laura Brady** (Professor, Dept. of English)<br>**Fabian Goulay** (Associate Professor, Dept. of Chemistry) |
| West Virginia Science Public Outreach Team (SPOT) | **Kathryn Williamson** (Teaching Associate Professor, Dept. of Physics and Astronomy, WVU) |
| Undergrad panel for current Upward Bound College Exploration Week (~5 SURE students across majors) | WVU Upward Bound/TRIO<br>**Landon Southerly** (Director, WVU Upward Bound/TRIO) |

*Our summer programs have been enriched by the contributions of these speakers. We are deeply appreciative and want to thank all our speakers for their time, effort, and support of summer undergraduate research experiences at West Virginia University!*

**VI. Websites**

***Need more information?***

- Astrophysics REU: https://gwac.wvu.edu/astrophysics-reu
- Chemistry REU: http://undergraduateresearch.wvu.edu/reu-site-research-in-chemistry-at-wvu
- Honors College: http://www.honors.wvu.edu/
- Honors EXCEL: https://www.honors.wvu.edu/academics/honors-excel-program
- IMMB Undergraduate Research Internship Program: https://medicine.hsc.wvu.edu/immunology-and-medical-microbiology/internships-and-research-opportunities/
- Office of Undergraduate Research: http://undergraduateresearch.wvu.edu/
- Research Apprenticeship Program: https://undergraduateresearch.wvu.edu/researchopportunities/wvu-opportunities/research-apprenticeship-programs
- Robotics REU: https://robotics.wvu.edu/nsf-reu-site

- Summer Undergraduate Vision Research Fellowship Program: https://medicine.hsc.wvu.edu/eye/research/vision-research/summer-undergraduate-vision-research-fellowship-program/
- WVU Cancer Institute Summer Undergraduate Research Fellowship Program: http://wvucancer.org/education/undergraduate/
- WVU SURE: https://undergraduateresearch.wvu.edu/research-opportunities/wvuopportunities/summer-undergraduate-research-experience-sure
- WVU's Beckman Scholars Program: https://undergraduateresearch.wvu.edu/researchopportunities/wvu-opportunities/beckman-scholars-program

## VII. Acknowledgements

### A. Personnel

**WVU SURE**
Michelle Richards-Bab, Director/Educ. Coord.
Rita Rio, Co-Director
Morgan Simpson, Graduate Teaching Assistant
Sarah Lempka, Graduate Teaching Assistant
Emily Heller, Graduate Teaching Assistant

**Virtual Symposium - Office of Undergraduate Research Staff**
Michelle Richards-Babb, Director
Cinthia Pacheco, Assistant Director
Paige Zalman, Program Coordinator
Kevin Walden, Program Coordinator

**Symposium Booklet**
Michelle Richards-Babb: design and editing
Kevin Walden: editing, typesetting, and cover art

### B. Cover Art Synopsis

The cover art for this year's summer symposium booklet reflects the creativity, innovation, and humor of the participants in light of this year's virtual WVU SURE. At various points throughout the program, students were asked to use the annotate feature within Zoom to respond to icebreakers, including prompts such as: "Draw something that represents (i) your research project or (ii) something you did this weekend," "Draw something that represents your career goals post-undergraduate schooling," and "Draw something that represents your research results thus far." We would like to thank all the artists within this year's WVU SURE and their willingness to share their responses over Zoom.

**Presentation #1**

# Conoideocrella luteorostrata, a Potential Biocontrol of Elongate Hemlock Scale in the Eastern United States

**Hosanna Barrett*, Brian Lovett, and Matt T. Kasson**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, West Virginia, 26506*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #1 | Presentation Time: 12:00-12:15 PM (EST)

**Student's Major:** Biology

The goal of this project is to develop natural fungal pathogens of the invasive Christmas tree pest elongate hemlock scale insects in the eastern U.S. as biocontrol agents. In the Summer of 2020, a fungus causing an epizootic in elongate hemlock scales in North Carolina was isolated and molecularly identified as Conoideocrella luteorostrata (Clavicipitaceae, Hypocreales, Ascomycota). Elongate hemlock scales in the nymph and adult female stages on hemlock branches were dipped in C. luteorostrata spores suspended in a 0.01% Tween20 solution at various concentrations. Observed symptoms and mortality in the treatments were reported daily for two weeks and maintained to observe any additional symptoms. Several of these treatments were conducted to optimize our protocol. Fungal outgrowth was not observed in the adult females in this setting, but C. luteorostrata was re-isolated from a treated nymph. We intend to further investigate the pathogenicity of this fungus through bioassays against elongate hemlock scale crawlers. C. luteorostrata may provide a biocontrol option for Christmas tree farmers.

**Funding:** Christmas tree promotion board Grant #20-10-WVU

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #2**

# Data from the WVU buck performance test is used to make genetic herd improvements

**Charles M. Becher* and Scott A. Bowdridge**
*Davis College of Agriculture Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26505*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #1 | Presentation Time: 12:15-12:30 PM (EST)

**Student's Major:** Animal and Nutritional Sciences

Selective breeding of livestock is integral to maintaining herd-wide genetic progress. When large-scale genetic evaluation programs are unavailable, performance tests are critical to determining phenotypic trends across herds. In WVU's Annual Buck Test, 172 Kiko goats, from 38 producers representing 16 different states, are brought to a common, unbiased environment to measure weight gain, muscling, and parasite resistance. Our test is unique as animals are infected with Haemonchus contortus (Barber Pole Worm), the greatest contributor to non-predator death loss for small ruminant producers. At intake, goats are treated with dewormer to clear residual infection and allow for establishment of a resistance baseline prior to controlled infection with H. contortus. Fecal egg counts (FEC) are used to estimate parasite load by assessing the number of worm eggs per gram of feces. Intake FEC averaged 576 eggs/g and dropped to 25 eggs/g by test-start, representing a 96% reduction post-deworming. The test goal is to provide producers a service that allows them to make data-based phenotypic improvements to their herd's genetics, yielding healthier, more productive livestock.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #3**

# Effects of Yucca schidigera Plant Extract on Whole Blood Chemistry of Dairy Heifers

**Shelby M. Collins*, Godstime A. Taiwo, and Ibukun M Ogunade**
*Division of Animal and Nutritional Science, West Virginia University, Morgantown, WV 262506-6045*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #1 | Presentation Time: 12:30-12:45 PM (EST)

**Student's Major:** Biology

Blood chemistry profiling can be used to assess the metabolic status of animals. This study was conducted to evaluate the impact of Yucca Schidigera plant extract (SAP) on blood chemistry of dairy heifers. In a 32-day feeding trial, eight dairy heifers were allotted randomly to 1 of 2 treatments: basal diet with no additive (CON; n = 4) or a basal diet with 2 grams of SAP bolused daily via drenching gun (SAP; n = 4). Blood samples were collected on days 0, 8, 16, 24, and 32. Immediately after collection, the whole blood was analyzed for 15 blood chemistry metabolites using a Catalyst Dx Chemistry Analyzer. The data were statistically analyzed using SAS. No treatment effects ($P > 0.05$) were detected for all the metabolites; however, there were treatment by day interaction effects ($P < 0.05$) for blood total bilirubin, lipase, and phosphorus. Therefore, the results suggest that Yucca Schidigera extract supplementation possibly alters the metabolic status of the dairy heifers on certain days during the experiment.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #4**

# Temperature, Oxygen, and Vegetation as Drivers of Microbial Dynamics in Warming Boreal Peatlands

**Teagan Kuzniar*, Chansotheary Dang, and Ember Morrissey**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #1 | Presentation Time: 12:45-1:00 PM (EST)

**Student's Major:** Environmental Microbiology

Boreal peatlands, a type of wetland, have slow rates of organic matter decomposition due to the water-saturated and oxygen-limited environment. This causes the accumulation of organic carbon and sequesters atmospheric carbon dioxide. Climate warming is predicted to cause increased greenhouse gas emissions from peatlands due to increased rates of microbial metabolism and organic matter decomposition. This is expected to cause a shift in vegetation from sphagnum moss to vascular plants. However, little is known as to how vegetation and temperature affect individual microbial taxa metabolism. We conducted a warming experiment using soil from Cranberry Glades, W.V., the southernmost boreal peatland in North America. We will utilize quantitative stable isotope probing (qSIP) to determine how individual wetland microbial species' growth rates change with rising temperatures and if these changes are dependent upon oxygen availability and vegetation. Preliminary data suggests the accumulation of carbon will increase under both aerobic and anaerobic conditions with rising temperatures. Understanding how microbial communities respond to warming is essential to determining how these ecosystems will respond to global climate change.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #5**

# Rare earth elements association in inorganic and organic fractions of Appalachian coals and shales

**Bennington Opdahl*, Rachel Yesenchak, Shailee Bhattacharya, Vikas Agrawal, and Shikha Sharma**
*Department of Geology and Geography, West Virginia University, Morgantown, WV, 26506*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #1 | Presentation Time: 1:00-1:15 PM (EST)

**Student's Major:** Chemistry

Rare earth elements are in immense global demand as they are essential for all the major advancements in energy, electronics, optics, and defense industries. In recent years, coal and byproducts of coal, and shales have been explored as a potential source of REEs (Rare Earth Elements) due to their enriched REE content. However, the association of REEs in inorganic or organic fractions of different types of coal and shale is still not well understood. In this study, we investigate the association of REEs in different fractions of shales and bituminous coals from the Appalachian basin by using a sequential extraction procedure. The REEs associated with the exchangeable fraction, carbonates, Fe-Mn oxides, organic bound, and silicates fraction from different coal and samples are being investigated. The results from these experiments will help determine the mechanism of REE enrichment in shale and bituminous coals. The broader implications of this study are that it will help develop strategies for maximizing the extraction efficiency and minimizing the extraction cost of REEs from Appalachian coals and shale.

**Funding:** IsoBioGem Lab Funds

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #6**

# Tracing Retinal Metabolism Through Intravitreal Injection of Labeled Glucose

**Emily V. Adis*, Rong Xu, and Jianhai Du**
*Department of Ophthalmology and Visual Sciences, West Virginia University, Morgantown, WV 26505*

**Field:** Health Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 12:00-12:15 PM (EST)

**Student's Major:** Biochemistry

Glucose is the major energy source for the eye's retina. Improper glucose metabolism has been linked to degenerative retinal diseases, including diabetic retinopathy and age-related macular degeneration. Studying glucose metabolism is vital to understand the metabolic basis of retinal diseases. 13C glucose has been widely used to trace glucose metabolism, however, current options of intravenous, intraperitoneal, and oral delivery have systemic side effects. Our aim is to develop an eye-specific method to trace glucose metabolism. We intravitreally injected 13C glucose into one eye of 2-month old mice and harvested ocular tissues and blood at different times to measure metabolites derived from 13C glucose using mass spectrometry. 13C glucose-labeled retinal intermediates in glycolysis and the tricarboxylic acid cycle peaked at 5 and 15 minutes, but tapered off within 1 hour and disappeared 8 hours after injection. 13C labeled metabolites were absent in the blood and control eye. We confirmed eye-specific glucose uptake by imaging with fluorescent-labeled glucose using a confocal microscope. In conclusion, we developed a simple, cost-effective, eye-specific method for tracing glucose metabolism in vivo.

**Funding:** NIH

**Program/mechanism supporting research/creative efforts:**
WVU Vision Research Fellowship Program

**Presentation #7**

# Inhibition of Mycobacterium tuberculosis Induced Bone Erosion by the Novel Compound ELP-004

**Kendyl Berry*, Jamie McCall, and John Barnett**
*Department of Microbiology, Immunology, and Cell Biology*

**Field:** Health Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 12:15-12:30 PM (EST)

**Student's Major:** Immunology and Medical Microbiology

Mycobacterium tuberculosis (MTB) induces a serious bacterial infection, tuberculosis (TB). Although TB primarily attacks the lungs, this bacteria can spread throughout the body, causing a form of arthritis resulting in soft-tissue swelling, joint effusion, and bone erosion, referred to as tuberculosis arthritis (TA). Bone erosion associated with TA is resultant of enhanced osteoclast activity by the MTB infection. In a healthy person, osteoclasts work in conjunction with osteoblasts to remove old bone as new bone is created, in arthritis, this balance is skewed. A novel compound, ELP-004, was shown to inhibit osteoclast induction in vitro and reduce disease severity in animal models of arthritis. We hypothesized that ELP-004 would also reduce the formation of MTB-induced multinucleated cells. To test whether ELP-004 prevented MTB-induced osteoclastogenesis, RAW 264.7 cells were treated using a non-infectious strain of MTB, H37RV, with and without ELP-004 and with RANKL as a positive control. Experimentation showed that while MTB treated cells do form multinucleated cells morphologically resembling osteoclasts, further investigation is necessary to classify and determine the function of TB-induced multinucleated cells.

**Funding:** NIH AR074812

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #8**

# Identification of a Gene Involved in Production of Pharmaceutically Important Lysergic Acid Amides

**Kelcie N. Britton*, Chey R. Steen, Jessi K. Sampson, and Daniel G. Panaccione**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506*

**Field:** Biological Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 12:30-12:45 PM (EST)

**Student's Major:** Immunology and Medical Microbiology

Ergot alkaloids are lysergic acid containing compounds produced by fungi associated with human and animal toxicoses. Despite their toxicity, modified and appropriately dosed ergot alkaloid derivatives are effective pharmaceutical treatments for some neurodegenerative diseases. Pathways to some ergot alkaloids have been determined, but the final step in synthesis of lysergic acid amides remains elusive. This gap is significant because many of the pharmaceutically relevant ergot alkaloids are derived from lysergic acid amides. Lysergic acid α-hydroxyethylamide (LAH) is the main ergot alkaloid produced by the fungus Metarhizium brunneum. We hypothesize two genes, easP and estA, encode esterases involved in the final step of LAH biosynthesis. To test this hypothesis, CRISPR mutants were engineered in M. brunneum with easP alone or both estA and easP mutated. Analysis of our mutant strains demonstrated the product of easP has a significant role in production of LAH; the easP mutant only accumulated half the LAH measured in non-mutant strains. Mutation of estA did not affect accumulation of lysergic acid amides, indicating the fungus has an alternate path to LAH.

**Funding:** Arnold and Mabel Beckman Foundation, NIH

**Program/mechanism supporting research/creative efforts:**
WVU Beckman Scholars Program

**Presentation #9**

# Monoamine transporters show decreased uptake with delta and kappa opioid receptors

**James G. Lamp1*, Benjamin J. Menarchek1*, Allison N. White2, and Vincent S. Setola1,2**
*1Department of Neuroscience and 2Department of Behavioral Medicine and Psychiatry, West Virginia University School of Medicine, Morgantown, WV 26506*

**Field:** Neurosciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 12:45-1:00 PM (EST)

**Student's Major:** Neuroscience

Such neuropsychiatric illnesses as depression, obsessive-compulsive disorder, and attention-deficit/hyperactivity disorder are treated using medications targeting monoamine transporter (MAT) activity. However, these treatments are not always effective. In such cases, alternative/adjunctive therapies are used. Previous studies revealed a relationship between the kappa opioid receptor (KOR) and the dopamine transporter (DAT), but the relationship between other opioid receptors (ORs) and MATs has not been thoroughly characterized. Thus, cells expressing one of the three MATs in the absence or presence of one of the three ORs were treated with either vehicle or an appropriate OR agonist, and MAT activity was subsequently assessed. Our data suggest that coexpression of the delta OR (DOR) or KOR—but not the mu OR (MOR)—along with a MAT markedly decreases transporter-mediated substrate uptake. Additionally, the effects of ORs on MATs were insensitive to either OR agonist or pertussis toxin, a compound that deactivates OR-mediated G protein signaling. These findings suggest that KORs and DORs each have antidepressant-like effects on MATs, suggesting that these receptors may be targets for new antidepressants.

**Funding:** This work was funded in part by NIH/NIDA U18DA052497 (to VS) and NIH/NIDA R36DA051703 (to ANW). ANW acknowledges support from NIH/NIGMS T32GM132494.

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #10**

# Gender Differences in Eye Metabolism in Fed and Fasted Mice

**Meghashri Saravanan,* Jianhai Wang Du, Rong Xu, and Yekai**
*Department of Ophthalmology and Visual Sciences, West Virginia University Health Science Center, Morgantown, WV 260505-6045*

**Field:** Biological Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 1:00-1:15 PM (EST)

**Student's Major:** Biology

Metabolic dysfunction is one of the most common features found in multiple eye diseases. Gender, while being an important biological variable, is still an unexplored area of
research when it comes to its impact on eye metabolism. This study aims to investigate the effects of gender on ocular metabolome in fasted and unfasted mice. Two groups of two-month-old mice separated by sex, were deprived of food, and fed a normal diet for 18 hours. The ocular tissues (Retina, Retinal Pigment Epithelium, choroid and, Lens), blood, and liver were analyzed for targeted metabolomics using mass spectrometry. Multivariate analysis showed significant gender differences in vitamin metabolism, creatine metabolism, and amino acid metabolism in ocular tissue, especially in fasted mice. Strikingly, the vitamin pantothenic acid is higher in all the female ocular tissues in contrast to liver or blood. In conclusion these findings show that there are eye-specific differences in metabolome influenced by fasting, that show significant gender bias. These findings show great promise in aiding future therapeutic interventions in gender specific ocular metabolic dysfunction.

**Funding:** National Eye Institute, BrightFocus Foundation

**Program/mechanism supporting research/creative efforts:**
WVU Vision Research Fellowship Program

**Presentation #11**

# NMNAT1, A Protein Linked With Blinding Diseases Is Post-Translationally Lipid Modified By Protein Palmitoylation

**Anthony Siler*, David Sokolov, and Saravanan Kolandaivelu**
*Departments of Ophthalmology and Visual Sciences, and Biochemistry, West Virginia University Eye Institute, One Medical Center Drive, Morgantown, WV-26506*

**Field:** Health Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 1:15-1:30 PM (EST)

**Student's Major:** Biology

Nicotinamide mononucleotide adenylyl transferase-1 (NMNAT1), a protein exclusively present in the nucleus responsible for NAD+ synthesis, plays a vital role in metabolism and redox biology. Even though NMNAT1 is ubiquitously expressed, mutations can lead to severe blinding diseases of which the precise mechanisms are not yet fully understood. This is the first study demonstrating that NMNAT1 is post translational lipid modified by "palmitoylation". In general, palmitoylation plays diverse roles in protein sorting, localization, stability, activity, and subcellular trafficking. To understand further, we focused to identify the DHHC-domain containing acyl transferase that is responsible for NMNAT1 palmitoylation. To address this, we will co-transfect NMNAT1 construct with DHHC enzymes into HEK-293T cells. Furthermore, acyl-resin assisted capture (Acyl-RAC) method was performed to evaluate NMNAT1 palmitoylation. To determine the palmitoylation role in protein stability and subcellular localization, we will inhibit NMNAT1 palmitoylation with palmitoyl inhibitor 2-Bromopalmitate (2-BP). Overall, our study is crucial for confirming NMNAT1 palmitoylation and determining DHHC enzymes are responsible for palmitoylation, which are important steps toward better understanding NMNAT1 and its role in normal cellular function.

**Funding:** Saravanan Kolandaivelu Startup Funding

**Program/mechanism supporting research/creative efforts:**
WVU Vision Research Fellowship Program

**Presentation #12**

# Regulator of G protein Signaling-12 (RGS12) in Dopamine and Seretonin Homeostasis and Synaptic Clearance

**Jessica Underwood*, James Lamp*, Benjamin Menarchek*, Allison White, and Vincent Setola**
*West Virginia University School of Medicine, Department of Neuroscience and Behaviorial Medicine, Rockefeller Neuroscience Institute, Morgantown, WV 26505*

**Field:** Biological Sciences
**Assigned Category:** Biological & Health Sciences (Oral Presentations)
**Oral Presentation Details:** Zoom Room #2 | Presentation Time: 1:30-1:45 PM (EST)

**Student's Major:** Chemistry

Regulator of G protein Signaling-12 (RGS12) is a protein expressed in areas of the brain implicated in the actions of psychostimulants. To address whether RGS12 plays a role in the behavioral and biochemical effects of psychostimulants, our group has been studying mice lacking RGS12. Unlike wild-type mice, RGS12-null mice exhibit essentially no acute locomotor stimulation when treated with such psychostimulants as amphetamine and cocaine. Previous work from our group has shown that absence of RGS12 increases the expresssion and function of proteins involved in synaptic clearance of dopamine (DA) and serotonin (5-HT), two key neurotransmitters engaged in psychostimulant actions. As such, we hypothesize that mice missing RGS12 will display altered tissular levels/homeostasis of DA and 5-HT. Further, we predict that mice lacking RGS12 will more efficiently clear psychostimulant-induced increases in DA and 5-HT from relevant brain synapses. We will test our hypotheses using optimized high-performance liquid chromatography coupled with high-sensitivity electrochemical detection. Tissues samples and extracellular intracerebral microdialysates will be subject to our analytical methods to assess the RGS12's role in DA/5-HT homeostasis and clearance.

**Funding:** Funded in part by NIH/NIDA U18DA052497 (to VS) and NIH/NIDA R36DA051703 (to ANW). ANW acknowledges support from NIH/NIGMS T32GM132494.

**Program/mechanism supporting research/creative efforts:**
Other
Honors EXCEL

**Presentation #13**

# Perspective on Mastery-Based Grading

**Yaronn James C. Arciaga* and Vicki Sealey**
*146 Tuscany Trail*

**Field:** Mathematics
**Assigned Category:** Human Engagement (Oral Presentations)
**Oral Presentation Details:** Zoom Room #3 | Presentation Time: 12:00-12:15 PM (EST)

**Student's Major:** Mathematics

Mastery-Based Grading (MBG) is a grading system that has students earn a grade by mastering objectives through multiple attempts on assessments. A review of the literature shows a generally positive outlook from students on the implementation of MBG in comparison to traditional grading, which gears the focus from a teacher-centered classroom experience to a learner-centered classroom experience. This study focuses on understanding the successes and challenges faced by West Virginia University students and professors as MBG was implemented in multiple mathematics classrooms. We will interview four professors who recently implemented MBG in their classes. These classes include Calculus courses and an Introduction to Proofs course. Qualitative data will be collected from the professors' interviews. All students in the MBG classes will be asked to complete a survey, and select student volunteers will also participate in an interview. Findings from this study will demonstrate the consistency of the impact of MBG throughout mathematics courses, determining whether it will benefit future students and professors.

**Funding:** LSAMP

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #14**

# Relationship Between Parent-Child Relationships and Adolescent Depressive Symptoms

**Sarah Francis*, Jeffrey Hughes, and Amy Gentzler**
*Department of Psychology, West Virginia University, Morgantown, WV 26506*

**Field:** Social and Behavioral Sciences
**Assigned Category:** Human Engagement (Oral Presentations)
**Oral Presentation Details:** Zoom Room #3 | Presentation Time: 12:15-12:30 PM (EST)

**Student's Major:** Psychology

With rates of adolescent depression increasing, understanding potential correlates and predictors is essential. In this longitudinal correlational study, we evaluated associations between adolescents' depressive symptoms and measures of parent-child relationships. Two sets of surveys were completed six months apart by 229 adolescents (with 229 mothers and 72 fathers). Results showed that teen-reported depressive symptoms were significantly, positively correlated with teen-reported attachment anxiety and avoidance to mothers and fathers and significantly, negatively correlated with mother-reported relationship satisfaction and disclosure from their teen. Additionally, lower mother- and father-reported relationship satisfaction with their teens significantly predicted more teen-reported depressive symptoms six months later. These results suggest poorer quality parent-child relationships are associated with adolescent depressive symptoms, and that parents' perceptions of the relationships may be indicative of more teens' depressive symptoms months later. Further research should investigate particular problems in parent-child relationships. Practitioners working with adolescents should interview parents about their parent-child relationship, and if problems are identified, the teen should be screened for depression and family counseling could be recommended to promote healthy communication and secure attachments.

**Funding:** National Institute of Child Health & Human Development 1 R15 HD078920-01A1

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #15**

# Understanding Texas's Response to the Compounding Crises of Winter Storm Uri and COVID-19

**Daniel Sledge1, Herschel F. Thomas2, and Giana M. Loretta2***
*1Department of Political Science, University of Texas at Arlington, Arlington, TX 76019 and*
*2Department of Political Science, West Virginia University, Morgantown, WV 26506*

**Field:** Social and Behavioral Sciences
**Assigned Category:** Human Engagement (Oral Presentations)
**Oral Presentation Details:** Zoom Room #3 | Presentation Time: 12:30-12:45 PM (EST)

**Student's Major:** Political Science*, Philosophy, Communication Studies

In February 2021, winter storm Uri ravaged the state of Texas amidst the COVID-19 pandemic. Governments and non-governmental entities (NGEs: non-profits, religious groups, and businesses), already strained by COVID-19, were further stressed by frigid weather and widespread loss of utilities. This research will provide a greater understanding of Texas's response to these simultaneous disasters- especially the role of NGEs within it- and the complex American disaster state as a whole. To achieve this, we are implementing three waves of state-wide surveys of 1) officials from regional and local health agencies, 2) emergency managers, and 3) a sample of non-profits operating in Texas. Additionally, semi-structured interviews with government agencies and NGEs are also being conducted. Preliminary findings suggest that while COVID-19 restricted NGEs' outreach and funding activities, it increased their adaptive capacities to serve clients. As such, the effects of winter storm Uri were mitigated by groups prepared to adjust to crises. Beyond Texas, these findings will be of exceptional importance to understanding national preparedness for and responses to disasters.

**Funding:** National Science Foundation (Award Number 2130062)

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #16**

# The legacy of Bernard Woma: a resource for independent study of Dagara gyil

**Elizabeth Rockwell* and Michael Vercelli**
*School of Music, College of Creative Arts, West Virginia University, Morgantown, WV 26506*

**Field:** Creative Arts
**Assigned Category:** Human Engagement (Oral Presentations)
**Oral Presentation Details:** Zoom Room #3 | Presentation Time: 12:45-1:00 PM (EST)

**Student's Major:** Women's and Gender Studies; Music

The gyil is a West African xylophone associated with the Dagara people in Ghana and Burkina Faso. Bernard Woma, a master gyil player, was crucial to the dissemination of the instrument outside of Dagara culture. Before his untimely passing in 2018, Woma worked with Dr. Michael Vercelli (WVU) to design a method book that allowed beginner gyil players to learn fundamental skills independently before traveling to Africa to learn from a master musician. Together, they posed a question: will translating an oral tradition to the written page allow people outside of the Dagara community to learn it? Using a triple-channel learning model, the book teaches through visual transcriptions and auditory examples of Dagara repertoire while encouraging retention through kinesthetic practices. My role in this research was to learn gyil through this resource as a beginning student to determine if this project can reach its intended goal despite Woma's absence. We found that the triple-channel model was an effective way to translate Dagara repertoire and best represent Bernard Woma's pedagogical practice.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #17**

# Land Access in the Italian Alps and How it Influenced Relationships in Premodern Societies

**Falon Snodgrass* and Matthew Vester**
*Department of History, West Virginia University, Morgantown, WV 26506*

**Field:** Human Engagement* (See definition to the side.)
**Assigned Category:** Human Engagement (Oral Presentations)
**Oral Presentation Details:** Zoom Room #3 | Presentation Time: 1:00-1:15 PM (EST)

**Student's Major:** French and International Studies

Historians have long recognized the importance of studying access to land and how land mediated relationships in premodern, rural societies. However, few such studies have been undertaken. A better understanding of these relationships can inform development experts and policymakers working on access to land in today's world. Sixteenth-century notarial records from a French-speaking community in the Italian Alps, Saint Vincent, document how land structured social interactions. These include land sales, mortgages, and marriage contracts. They are written in old French script, requiring paleography training to decipher. We read through the available records from 1584, took notes based on a number of variables (such as average land prices), and compiled the data into a spreadsheet for quantitative analysis. Preliminary results show a complex, community economy where land sales often included repurchase rights to be used strategically within and outside of family structures to maintain power, family cohesiveness, and as a form of mutual aid between relatives. We also found that women appeared to maintain much more agency in contracts than expected in a patriarchal society.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #18**

# Enzyme Immobilization within a Hyaluronic Acid Matrix for Biosensor Applications

**Jackie R. Arnold,* Jordan S. Chapman and Cerasela Zoica Dinu**
*Department of Chemical and Biomedical Engineering, West Virginia University, Morgantown, WV 26506*

**Field:** Engineering
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 12:00-12:15 PM (EST)

**Student's Major:** Chemical Engineering

Enzymes comprise an integral system in the success and efficiency of biological reactions; their specific activities have been transferred from biological to synthetic environments and applied within the chemical, environmental, and biomedical industries to increase process productivity. There are, however, limitations to enzyme-based technologies including fragility, user-controllability, shelf-life, and large-scale usage. To approach such limitations, a technique involving enzyme immobilization within biocompatible, biodegradable, net-like, and amphiphilic alkyl group-hyaluronic acid (HA) hydrogels of varying pore sizes has been explored. Emphasis is placed on glucose oxidase (GOx), a model enzyme frequently used in biosensors and the pharmaceutical industry, before this proof-of-concept immobilization platform can be extended to other enzymes and applications. Following physical adsorption of GOx within the alkyl-HA gels, it is envisioned that both activity and stability of the entrapped enzyme can be optimized. Attachment of these hydrogels onto functionalized gold electrodes creates opportunity for the development of a biosensor with real-time tracking capabilities. Further, analyses could enhance the body of knowledge and realm of implementation of GOx immobilization in biosensing, drug delivery, and tissue engineering.

**Funding:** National Science Foundation 1454230

**Program/mechanism supporting research/creative efforts:**
WVU Beckman Scholars Program

**Presentation #19**

# Mapping Neutral Hydrogen from M31's Circumgalactic Medium

**Kelby Palencia-Torres*1 and D.J Pisano2**
*Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506*

**Field:** Physical Sciences
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 12:15-12:30 PM (EST)

**Student's Major:** Physics

The Absorption Maps in the Gas of Andromeda (AMIGA) project, funded by the Hubble Space Telescope, surveys the circumgalactic medium around the Andromeda Galaxy's disk to understand the distribution of materials and its properties. Galaxies maintain an observed steady rate of star formation despite the passing of billions of years. To sustain a steady rate of star formation they must acquire gas and material from the circumgalactic medium. Using neutral hydrogen emission at the 21 cm wavelength, we can observe this gas by performing radio observations with the Green Bank telescope in West Virginia. By detecting these hydrogen clouds a map of the circumgalactic medium can be produced. In this project we look at data from the Green Bank Telescope to map the streams of gas clouds near the Andromeda galaxy's disk in the circumgalactic medium. The resulting images will be used to update the current map of the gas clouds around M31.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU Astrophysics REU

**Presentation #20**

# A Novel Solution to Inertial Measurement Unit (IMU) Location Drift During Long Distance Traversal

**Spencer Regnier*, Yu Gu, Dylan Covell, and Jonas Amoama Bredu**
*Statler College of Engineering, Interactive Robotics Lab, West Virginia University, Morgantown, WV 26506*

**Field:** Engineering
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 12:30-12:45 PM (EST)

**Student's Major:** Mechanical Engieering

Inertial Measurement Units (IMU), paired with Global Positioning Satellites (GPS), are used in almost every modern piece of technology as a way to localize its position. Someday, when we decide to leave earth, we will not have our expansive network of GPS satellites to help track our location and will have to rely on IMUs alone. When used for long periods of time, the uncertainty of an individual IMU's data can be astronomical and could result in a total loss of the user's position. Our research is into a Zero Velocity Update (ZUPT) payload where a secondary IMU is placed on the ground and then retracted back into the rover chassis. Keeping said IMU stationary on the ground while driving gives the main IMU a reference to true zero allowing it to recalibrate and maintain accurate IMU position data without stopping. This design can be implemented into any other system, that uses an IMU to localize, and will help to decrease the IMU's uncertainty, greatly increasing the precision and reliability of its localization data.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #21**

# Gravitational Wave Detection with Pulsars

**Sparrow Roch*, Alexandra Higley,* Maura McLaughlin, and Manjari Bagchi***
*Center for Gravitational Waves and Cosmology, Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26505**

**Field:** Physical Sciences
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 12:45-1:00 PM (EST)

**Student's Major:** Physics, Computer Science

Pulsars are extremely dense, highly magnetized neutron stars that rotate with a fast, reliable period, producing an intense radiation beam comparable to the pulse of a lighthouse. Timing unique pulses from pulsars at different locations in the galaxy allows for novel ways to study the universe, the most exciting of which is the potential to detect gravitational waves at much lower frequencies than previously detected. The North American Nanohertz Observatory for Gravitational Waves (NANOGrav) is a collaboration hoping to study the universe with these new detections. Such studies rely on accurate observations and precise location coordinates of telescopes used to gather data. Observatory positions are assumed to be well-defined, but inexact coordinates could potentially skew or otherwise manipulate pulsar timing data. This project reevaluates NANOGrav pulsar data with intentionally imposed positional errors to examine to what extent observatory positions must be inaccurate in order to significantly affect the resulting data. A new gravitational wave analysis will be done to determine whether or not these positional errors could falsely provoke results that mimic gravitational wave signals.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
Astrophysics IRES

**Presentation #22**

# Active Cooperative Localization of Swarm Robots using Adaptive Boid's Rules

**Trevor R. Smith*, Eduardo Gutierrez, Jonas A Bredu, Jason Gross, and Yu Gu**
*Department of Mechanical & Aerospace Engineering, West Virginia University, Morgantown, WV 26506-6045*

**Field:** Engineering
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 1:00-1:15 PM (EST)

**Student's Major:** Mechanical and Aerospace Engineering

In this study active cooperative localization of robots is explored using Boid's rules to improve localization strategies for robotic swarms. Boid's rules model complex biological swarm behavior, by weighted control of each agent's heading alignment, cohesion, and separation from the group. We have augmented this model with the inclusion of homing and task rules, along with adapting the gains on each controller based on the local stimuli of neighboring robots and the current localization estimate. As a result, the robots are encouraged to perform more favorable emergent behaviors such as clustering or road building when the agents' localization estimates are poor and diffusion behaviors when the estimate is sufficient. Furthermore, this adaption is decentralized and independent of the localization strategy, thus it can be easily incorporated into existing swarm robotic frameworks. This method was tested with multiple localization frameworks such as centralized Extended Kalman Filter (EKF), decentralized EKF, and Covariance Intersection in both a random generated waypoint environment and in a robotic foraging environment.

**Funding:** National Science Foundation

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #23**

# STEM Outreach through Drone Technology

**Jonathan Wimer*, Dana Huebert-Lima, and Patrick Browning**
*Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506*

**Field:** Engineering
**Assigned Category:** Physical Sciences & Engineering (Oral Presentations)
**Oral Presentation Details:** Zoom Room #4 | Presentation Time: 1:15-1:30 PM (EST)

**Student's Major:** Mechanical Engineering

The United States is currently experiencing a growth in science, technology, engineering and math (STEM) occupations at a rate of 24% while other industries on average are growing at a rate of 4%. Workers in these fields play a critical role in the sustained growth and stability of the United States' economy. STEM education empowers the next generation of innovators. Although it is apparent that most future jobs require a basic understanding of science and math, the average U.S. student has lower scores than other developing countries. West Virginia in particular has very poor performance, with the number of students at or above proficient in mathematics reaching only 24 percent according to the National Assessment of Educational Progress. Therefore, it is crucial that STEM outreach and educational programs be created for students. To help solve this problem, an Unmanned Aerial Vehicle program was created for local high school students to develop both technical and scientific skills. In addition, outreach supplements were created for WVU UAV related clubs to increase STEM related student engagement.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
Honors Excel Program

**Presentation #24**

# How Does the Decline in Summer Greenness Differ by Tree Species?

**William D. Brown*, Steven M. Guinn, Yiting Fan, Andrew J Elmore, and Brenden E. McNeil**
*Department of Geology and Geography, West Virginia University, Morgantown, WV, 26506*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Reagents Degree

The insalubrious environments created by climate change can stress trees, often resulting in declining summer greenness and productivity. These declines in greenness have been monitored for whole forests using tower-mounted web cameras, or phenocams. Since different tree species react to climate change-induced stress differently, we hypothesized that phenocams could identify the decline in greenness for each tree species. Therefore, we identify and analyze summer greenness from one hundred trees visible within phenocams mounted on nine National Ecological Observation Network towers across eastern North America. Specifically, we use the visible and near infrared images collected each half hour by the phenocams to measure the normalized difference vegetation index (NDVI), a common measure of greenness. We then evaluate the rate of change in NDVI between the peak greenness in early summer and the onset of leaf senescence in late summer. By providing insight into how each species is responding to climate change, our observations of species-specific differences in declining summer greenness can inform forecasts for forest productivity and health under climatic change.

**Funding:** National Science Foundation Directorate for Biological Sciences (BIO) Division of Environmental Biology Context Statement Macrosystems Biology & NEON-Enabled Science P210953

**Program/mechanism supporting research/creative efforts:**
Other
WVU Geography REU & WVU SURE

**Presentation #25**

# How Are AM Mycorrhizal and EM Mycorrhizal Tree Species Dispersed in Appalachian Forests?

**Ethan R. Cade*, Lydia R. Nicolai*, Megan A. Ponczek, and Brenden E. McNeil**
*Department of Geology and Geography, West Virginia University, Morgantown, WV 26505*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Environmental Geoscience

Accelerating climate change is affecting the growth of trees, and we know Appalachian tree species are responding differently to the increasingly wetter and warmer conditions with more prolonged periods of drought. But, to better predict how each tree species is responding to climate change, we need to identify the degree to which each species uses mycorrhizal fungi, or symbiotic fungi that grow on, around, and between the roots of trees, to acquire soil resources such as nutrients and water. Therefore, we tested whether the more intertwined mycorrhizae of trees with ectomycorrhizal (EM) associations (e.g. oaks) cause them to be more clustered within a forest than trees with arbuscular mycorrhizal (AM) associations (e.g. maples). To test this hypothesis, we mapped and analysed the distribution of over 10,000 trees in the Summit Bechtel Reserve Smithsonian ForestGEO megaplot in Southern West Virginia. By identifying the degree to which EM and AM trees are clustered within this dataset, we highlight which tree species may be better adapted to work together, and enhance their resiliency in the new Appalachian climate.

**Funding:** Appalachian Stewardship Foundation

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #26**

# Application of Geolocators on Canada Warblers (Cardellina canadensis) and Their Effect on Survival Probability

**Peyton A. Caylor,* Stephanie H. Augustine, and Christopher T. Rota**
*Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506-6108*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Wildlife and Fisheries Resources Management

Canada Warblers are small neotropical migrant birds whose populations across most of their range are either declining or stable, except in West Virginia where they are increasing. Geolocators are archival light level detecting devices that were used to track the paths of migration and understand the birds' wintering grounds conditions in relation to survival. Attaching geolocators have influenced behavior and survival according to previous research done on similar sized birds, so the Canada Warblers' return probability may be affected by the geolocators. In 2020, we banded and placed geolocators on 32 Canada Warblers, and banded an additional 78 birds without geolocators. The following year, 13 out of the 32 (40.6%) geolocator birds and 37 out of the 78 (47.4%) color-banded birds were detected. Despite the geolocator return rate being lower, there was no significant difference between birds with and without geolocators ($\chi 2 = 0.19428$, $p = 0.6594$). Geolocators as a result will not affect the parameters of the survival model of the population, making this a non-detrimental method of tracking this small species.

**Funding:** McIntire-Stennis

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #27**

# Deconvoluting the sesquiterpenoid biochemical pathway of Artemisia annua

**Emily Duckworth*, Vagner Benedito, and Michael Gutensohn**
*Division of Plant & Soil Sciences, West Virginia University, Morgantown, WV 26506*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Malaria is a mosquito-borne disease that affected 229 million people worldwide in 2019, resulting in more than 400,000 deaths. The most effective antimalarial medicine is the natural product from the herb, Artemisia annua called artemisinin. Artemisinin is a sesquiterpene lactone compound, which structure is too complex to synthesize in vitro. Although bioreactor production of feasible with microorganisms, the product become too expensive for governments in many poor countries to purchase. Therefore, in planta production remains the most economically viable way to produce artemisinin. The overall goal of this research is to enhance terpenoid biosynthesis in A. annua and boost artemisinin accumulation in glandular trichomes of artemisia. We used Gas Chromatography – mass Spectrometry (GC-MS) to quantify and compare the abundance of mono- and sesquiterpenoids of 13 accessions of the A. annua germplasm collection at WVU. We have also started assessing volatile organic compound (VOC) headspace losses during artemisia cultivation in greenhouse conditions.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #28**

# Survey of Verticillium spp. occurring on Ailanthus in West Virginia as biological control agents

**Rachel L. Gadd,* Brian R. Lovett, Hannah M. Petronek, and Matthew T. Kasson**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26505*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Tree-of-heaven (Ailanthus altissima) is a highly invasive tree species that threatens the natural biodiversity of the mid-Atlantic region and requires extensive management. A naturally occurring fungus, Verticillium nonalfalfae, has been found to effectively kill tree-of-heaven in OH, PA, and VA. A second Verticillium species, V.dahliae, has also been recovered but is less effective in controlling tree-of-heaven. Over the last decade, various strains of V.nonalfalfae have been used as biocontrols in these states. Given that West Virginia borders all three of these states, it's possible that V.nonalfalfae is also present in WV. The main goal of this project was to scout for and isolate Verticillium spp. from symptomatic tree-of-heaven across WV in hopes of recovering the more virulent V. nonalfalfae to serve as a biocontrol in WV. Windshield surveys in the northern panhandle have uncovered several Verticillium infected Ailanthus stands. The isolates from these surveys were characterized morphologically by evaluating fungal resting structures and comparing them to known Verticillium strains. To date only V.dahliae has been recovered from these symptomatic stands but isolations are ongoing.

**Funding:** USDA APHIS

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #29**

# Establishing Optimal Forest Density for Growth of California Black Oak Within the Sierra Nevada

**John B. Holden IV*, Kathleen M. Conroy, Sophan Chhin, and Jianwei Zhang**
*1Forest Resources Management Program, Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia, 26506. 2Pacific Southwest Research Station, United States Forest Service,Redding, California 96002-9241*

**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Forest Resources Management

California black oak is a shade-intolerant, hardwood tree species that is experiencing population decline due to a change in western wildfire dynamics. Black oak survival and establishment requires an open forest structure created by wildfires that allows for an early successional growth advantage in black oak's root sprouting ability. Crown thinning has proven to be an effective silvicultural technique at mimicking this forest structure and may aid in providing black oak additional resiliency to competition. In this study, we examine differences in oak density and composition over time following a series of wildfires within Lassen National Forest. Preliminary analysis indicates that sites with initially low oak composition and density in years following a wildfire may hold potential for being favorable black oak sites. This result may be explained by lessened competition among young oak specimens, and thus greater survival and growth rates of the remaining black oak. With this information, crown thinning may be utilized more effectively in early rotation ages to improve black oak stand conditions while reducing the risk of high-severity crown fires.

**Funding:** US Forest Service Joint Venture Agreement #19-JV-11272139-021

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #30**

# Horticultural performance of ethylene-insensitive etr1-1 petunias

**Savannah Mead*and Nicole Waterland**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Horticulture

Petunias (Petunia x hybrida) are among the most popular and economically important crops in the floricultural industry. The value of floriculture crops increases with higher horticultural performance such as aesthetics consistency, uniformity, vigor, and longevity. The flower of etr1-1, an ethylene-insensitive mutant, is known to last twice as long (14 days) as wild type 'Mitchell Diploid' petunia (MD; 7 days). Horticultural performance between etr1-1 and MD petunias was evaluated for the potential economic benefit of etr1-1 usage. Horticultural performance metrics, including nutrient content, biomass, floral longevity, turgidity, and vigor, were compared between two cultivars. MD exhibited higher growth index as an indicator of vigor by 43% ($p<0.0001$). The average change in turgidity over a 24-hour postharvest submersion period was similar ($P=0.2643$). Both cultivars showed similar aesthetic consistency and uniformity at maturity. Better performance of etr1-1, indicated by the increased floral longevity and reduced vigor may offer excellent commercial potential, although other qualities such as tolerance to biotic and abiotic stresses should be considered.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #31**

# Efficiency of Lead-Cadmium Metal Uptake in Cannabis Sativa L.

**Zachary E. Moats* and Louis M McDonald**
*Davis College of Agriculture, Natural Resources, and Design, Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV, 26505*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Environmental Microbiology

Metal accumulation in soil is a serious problem for agriculture and environmental health. Unlike organic pollutants that can be broken down into carbon dioxide and water, metals persist. One result of this is that plants accumulate these metals. This metal accumulation poses obvious health risks. Following the passage of the Farm Bill in 2018, interest in Cannabis Sativa L. (Hemp) hemp skyrocketed for the plant's various agricultural, recreational and medicinal uses. However, the problem of accumulation of metals remains as Cannabis plants are known accumulators. Implications are serious as Cannabis crops grown in West Virginia have been rejected in the past for excessive lead (Pb) content. We initiated an experiment using Auto-flower hemp. A range of Pb and Cd concentrations (1/10 mg/L, 1/100 mg/L, 1/1000 mg/L, and 1/10,000 mg/L) were prepared in triplicate. With the goal of analyzing the uptake in premature hemp plants. Following 7 days of growth, varying levels of heavy metals will be determined by portable X-ray Fluorescence.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #32**

# Evaluation of urea amendments in microbiological media to quantify nematode trapping fungi

**Lily Neilsen* and James Kotcon**
*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506-6108*

**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Environmental Science and Political Science

Plant-parasitic nematodes in soil are a threat to crops, but Nematode Trapping Fungi (NTF) can capture and kill nematodes. NTFs are important as biological controls, however, it's difficult to monitor and quantify NTF in soil. The objective of this project was to evaluate whether urea amendments in media can stimulate trap formation and improve monitoring of NTFs. To test this, six soil samples were collected and incubated on agar media with nematode eggs extracted from the roots of tomato plants. Spores from A. oligospora and Dactylaria spp. cultures were added in some trials. Water agar plates with various concentrations of urea were inoculated with combinations of soil, eggs, and fungal spores. Urea increased fungal trap formation on water agar ($P<0.05$), but not corn meal agar. Urea at 150, 300, 600, and 1200 mg/L increased trap formation compared to unamended plates, the maximum trap formation occurred with 300 mg/L. We conclude that trap formation is stimulated by adding nematodes and urea and the combined amendments gave the best trap recovery.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #33**

# Effects of Water Deficit on the Growth of Appalachian Tree Species

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**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Environmental Geoscience

As climate change intensifies, it is causing species loss and declining biodiversity in Appalachian forests. Certain tree species are more susceptible to reduced growth, and even mortality as increasing temperatures and more variable precipitation cause larger water deficits. But, the relatively short time span of climate change makes it difficult to know which tree species are being most affected by altered water deficits. Therefore, we hypothesized that microclimates within ridges and valleys may produce variability in water deficits that are analogous to climate changing through time. We mapped and analyzed over 10,000 trees in the Summit Bechtel Reserve Smithsonian ForestGEO megaplot in southern West Virginia in order to test how the growth of 16 different tree species differed by modeled water deficits. In this even-aged stand, we used measurements of diameter at breast height (DBH) as a proxy for tree growth. By using geospatial software to model water deficits at each measured tree, we identified which tree species are growing faster in the wetter environments expected in the new Appalachian climate.

**Funding:** National Science Foundation DEB#2106080

**Program/mechanism supporting research/creative efforts:**
Other
WVU Geography REU & WVU SURE

**Presentation #34**

# Repeatedly Harvesting Narrow Strips of Forest for Energy Biomass Benefits the Herbaceous Layer

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**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Forest Resource Management

The repeated harvesting of wood as a source for energy biomass is a potential option to reduce fossil fuel usage. Responses of the forest ecosystem (e.g., soils, herbaceous plants) to a single cut have been well documented, but effects of repeated strip cutting for woody biomass harvest are not yet well studied. In this study, herb-layer cover, species richness and Shannon-Wiener diversity were compared between harvested areas (strips) of variable width (2.4 m, 3.7 m, 4.9 m), 2.4-m residual strips between the cut strips, and an uncut control. Treatment plots were cut in spring 2014 and 2020 and sampled in summer 2019 and 2020. Results show that the means of herb-layer cover, richness, and diversity were higher in cut strips (regardless of width) than in the control, but only the difference in cover was statistically significant (P=0.03). Thus, with respect to the herbaceous layer, strip cutting for woody biomass as an energy source appears to be sustainable and likely beneficial.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
WVU Davis College

**Presentation #35**

# Effects of Soil Transplant and Fertilization on Arbuscular Mycorrhizal Fungi Colonization in Miscanthus

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**Field:** Environmental Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Environmental Microbiology

Economically important plants benefit from arbuscular mycorrhizal fungi (AMF), a plant symbiont, which colonizes roots and grows hyphae outward to take up nutrients and water for the plant in exchange for sugars. One plant that benefits from this symbiosis is Miscanthus x giganteus (Miscanthus), a promising bioenergy crop. Factors impacting colonization of Miscanthus by AMF should be studied since AMF can aid in heavy metal resistance, drought tolerance, and nutrient uptake. The effects of inorganic fertilization and a soil transplant from an established, highly productive Miscanthus stand on AMF colonization were tested in a greenhouse experiment. Roots were harvested, stained, and inspected under a dissecting microscope. Four testing groups were used: inorganic fertilization, soil transplant, soil transplant and inorganic fertilization, and control. Inorganic fertilization drastically reduced the percent colonization (-7.52%). The soil transplant also decreased colonization, but less dramatically (-2.36%). The testing group with both treatments also drastically reduced colonization (-7.09%) Our results demonstrate that limiting inorganic fertilization should be considered for the propagation of Miscanthus.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #36**

# Irrigation timing affects plant growth and mineral nutrient concentration in coleus and kale.

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**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Horticulture

The irrigation regime can have a major impact on the growth and development of plants. Growers often irrigate their crop once a day or every other day. However, studies have shown that plants are experiencing mild drought stress between irrigation events, which can negatively affect plant growth. Two species of popular horticulture crops were examined to evaluate the effects of irrigation timing on growth and mineral uptake. Kale (Brassica oleracea), considered to be a nutritious vegetable crop, and coleus (Plectranthus scutellarioides), a popular ornamental crop, were irrigated equal volumes of water either 400 ml once a day (control) or 100 ml four times a day. After one week of irrigation, kale and coleus showed different patterns of growth index and mineral uptake. Coleus watered four times a day had a greater average growth index than the coleus watered once a day. In contrast, the average growth index of control kale was greater than that of kale watered four times a day. This study showed timing of irrigation affects plant growth in a species dependent manner.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #37**

# Far-red LED light treatment increased shoot height and diminished root capacity in kale

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**Field:** Agricultural Sciences
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Biochemistry

The utilization of light-emitting diodes (LED) has gradually increased in the last decade, and LEDs have become one of the primary light sources in food production. However, there is very little information on how each spectrum affects crop production. The aim of this study was to determine the effects of far-red and near UV LED on plant growth, mineral uptake, and phytochemical biosynthesis in kale. The kale plants underwent four separate treatments in growth chambers for five weeks. LED modules generating individual spectrum (near UV, U; blue,B; green,G; red, R; and far-red, F) were used. There were four treatments: BGR, BGRF, UBGR, UBGRF. Exposure of the plants to near UV LED resulted in a higher fresh weight when compared to far red exposure. The opposite trend was observed in average plant height. Diminished root capacity was also observed in plants exposed to far-red. Nutrient content and antioxidant analyses using ICP and ORAC will allow us to understand the effect of far-red and near UV light spectra on mineral uptake and antioxidant biosynthesis.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #38**

# Morphological and physiological variations associated with reproductive and vegetative salinity tolerance in Sorghum

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biology

Climate-change-induced salinity stress is a severe limitation on plant growth. To ensure the availability and affordability of grain products, identifying crop varieties that maintain yield under saline conditions is imperative. In the present study, Sorghum, a cereal crop commonly cultivated in regions with high soil salinity, was used to assess the relationship between vegetative and reproductive salinity tolerance. Twenty-five Sorghum genotypes were treated with either tap water (control) or 75mM NaCl solution (treatment) until the resulting grain reached maturity. Though this work is ongoing, it is hypothesized that accessions that maintain vegetative traits (i.e., chlorophyll content, biomass, and height) during salt exposure, defined as vegetatively tolerant, will similarly maintain reproductive traits (i.e., grain yield and seed size). Essentially, tolerant accessions will be more similar to their respective controls in both vegetative and reproductive qualities than sensitive accessions under salinity stress. This research will identify Sorghum genotypes with greater salinity tolerance that can be grown on marginal lands and/or irrigated with saline water, ultimately maximizing grain yield to provide quality food products for the growing population.

**Funding:** Henry W. Hurlbutt Memorial Fund and Honors EXCEL Program

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #39**

# Saccharomyces cerevisiae chromosomal stability in sgs1 and sir1, cac1 mutants

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biology and English

Saccharomyces cerevisiae (brewer's yeast) is a powerful model organism for studying the cellular mechanisms underlying chromosomal stability due to its rapid replication time and vast variety of genes with human homologs. The first aim of this project is to elucidate the role of Sgs1 RNA helicase in telomere maintenance of type II survivors. This is done via an overexpression screen whereby genes that can rescue Sgs1 deficient yeast cells grown on hydroxyurea may be identified. This data will then be used to compare this lengthening method with the Alternative Lengthening of Telomeres (ALT) occurring in cancers. Preliminary results have yielded 16 independent transformations. Our second project involves utilizing mating assays to assess how pericentric, noncoding RNAs affect genetic stability, particularly by measuring the loss of chromosome III in sir1, cac1 mutants. These tests are meant to determine how the loss of the SIR1 and CAC1 genes affect retention of chromosomal regions indicating diploidy. Findings from this project will likely progress age-related disease study, given the importance of genetic maintenance to organismal health.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #40**

# Conformational Changes of Syntaxin-3B in Regulating SNARE Complex Assembly

**Joshua Ferrar*, Claire Gething, Katie Dunleavy, Bishal Misra, Giovanni Howells, Mridul Jhawar*, and U. Brandon Choi**
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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Neurotransmitter release of synaptic vesicles relies on the assembly of the soluble N-ethylmaleimide-sensitive factor attachment protein receptor (SNARE) complex, consisting of syntaxin, SNAP-25, and synaptobrevin. The formation of the SNARE complex builds up the energy necessary to drive membrane fusion between the plasma membrane and the synaptic vesicle. However, little is known about how SNARE complex assembly is regulated. Here, we study syntaxin-3B residing in the retinal ribbon synapses using single-molecule fluorescence resonance energy transfer (smFRET) to monitor the conformational changes that modulate SNARE complex assembly. We found that syntaxin-3B is predominantly in the closed conformation, inefficiently forming the ternary SNARE complex. Conversely, a phosphomimetic mutation (T14E) at the N-terminal region, or the LE mutation (L165A, E166A) in the linker region between the Habc and the SNARE motif, allows efficient ternary SNARE complex assembly by allowing an open conformation of syntaxin-3B. In addition, Munc18-1, an essential chaperone for SNAREs, prevented the ternary SNARE complex formation by locking syntaxin-3B in an auto-inhibiting closed conformation, which was released by the phosphomimetic and LE mutations on syntaxin-3B.

**Funding:** West Virginia University

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #41**

# Analyzing MitoNEET Protection Against Paraquat-induced Oxidative Stress in C. Elegans Aging Models

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biochemistry

MitoNEET is an outer-mitochondrial membrane protein integral for mitochondrial function. Mitochondria produce ATP and reactive oxygen species (ROS). Mitochondrial dysfunction can cause over-accumulation of ROS contributing to oxidative stress which, in excess, accelerates neurodegeneration. However, the role of mitoNEET in age-related neurodegeneration is not fully understood. First (D1) and fifth (D5) day adult transgenic mitoNEET knockout, overexpressor, and wild-type Caenorhabditis elegans worms were stressed with paraquat (PQ). We hypothesize mitoNEET overexpressors will protect against oxidative stress while knockouts will reduce protection. Using CellROX green, dihydroethidium, and mitoSOX red fluorescent assays we visualized oxidative stress. Compared to controls, mitoNEET overexpression reduced D1 basal mitoSOX fluorescence ($p<0.0001$), as well as D1 PQ-challenged CellROX green and dihydroethidium ($p<0.01$) fluorescences. MitoNEET knockouts showed increases in CellROX green fluorescence in all populations, increased D1 ($p<0.0001$) and D5 ($p<0.05$) basal mitoSOX fluorescence, and basal D5 ($p<0.001$) and PQ treated ($p<0.0001$) dihydroethidium fluorescences when compared to wild-type populations. These data suggest that mitoNEET overexpression is protective against oxidative stress at early ages while the loss of mitoNEET progressively hinders protection throughout aging.

**Funding:** NIH: P20GM103434

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #42**

# Independent evolution of a lysergic acid amide in Aspergillus species

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Lysergic acid-derived ergot alkaloids are used in the production of pharmaceuticals. The fungi in the family Clavicipitaceae that are currently used to produce them are slow-growing and difficult to manipulate genetically. Through a genome mining approach, we discovered three species of Aspergillus capable of producing lysergic acid-derived ergot alkaloids. Aspergillus leporis, Aspergillus homomorphus, and Aspergillus hancockii all were fast-growing and able to produce large quantities of ergot alkaloids (mainly lysergic acid α-hydroxyethylamide (LAH)). A. leporis and A. homomorphus secreted most of the ergot alkaloids into the liquid medium, which could simplify the purification process when used industrially. A. leporis hydrolyzed LAH to ergine, while A. homomorphus maintained high concentrations of LAH over time. Phylogenetic analysis showed that the genes involved in the production of lysergic acid were orthologous to those of the Clavicipitaceae but the genes used to incorporate lysergic acid into an amide derivative evolved from different ancestral genes in the Aspergillus species. The LAH-producing Aspergillus species may be useful for study and production of these pharmaceutically important compounds.

**Funding:** Beckman Foundation and NIH grant 2R15-GM114774-2

**Program/mechanism supporting research/creative efforts:**
WVU Beckman Scholars Program

**Presentation #43**

# Biodiversity of Fungi Associated with American Fungus-Feeding Millipedes

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biology

Around 250 million years ago, before the supercontinent Pangaea broke apart, a group of millipedes evolved a rare, exclusively fungus-based diet. Now found on six continents, these ancient animals have persisted over millennia. Despite their long history, they have remained comparatively unstudied. In 2018, our lab analyzed the fungal associates of one species native to the U.S., Brachycybe lecontii, and discovered substantial fungal biodiversity including seven new species of fungi. At least 97% of fungus-feeding millipedes in the U.S. have never been studied in this capacity, suggesting the possibility for future discoveries of fungal biodiversity. We intend to remedy this gap in the literature by sampling nearly three dozen species of millipedes in the U.S. Then, we will isolate fungi from these millipedes, allow the cultures to grow in the lab, and use DNA sequencing to identify the cultured fungi. We expect that these studies will reveal dozens of previously unrecorded species of fungi and bring light to the ancient relationship between millipedes and their fungal partners.

**Funding:** National Geographic Society NGS-74229R-20

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #44**

# Screening Potential Endocrine Disrupting Compounds and their Impacts on Glucocorticoid Signaling

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Endocrine-disrupting compounds (EDCs) are chemicals that impair the function of endocrine hormones. Glucocorticoids are endocrine hormones produced by the adrenal glands that function to suppress inflammation. Disruption of glucocorticoid signaling is associated with inflammatory disease and cancer development. Little is known about the effects of EDCs on glucocorticoid signaling. Glucocorticoids primarily regulate biological functions through regulating gene transcription. We utilized a glucocorticoid-responsive luciferase to screen the impact of potential EDCs on glucocorticoid signaling. The herbicide Metolachlor, Dichlorodiphenyltrichloroethane (DDT), and the metal lead all inhibited glucocorticoid-induced luciferase. Next, we assessed cellular proliferation to determine if these chemicals were cytotoxic. Metolachlor and lead did not block the cell cycle, but DDT blocked progression through G1 phase. Mouse peritoneal macrophages were used to study the functional effects these metals and pesticides have on glucocorticoid's ability to suppress inflammation. Metolachlor inhibited the anti-inflammatory effects of glucocorticoids. These results indicate that metolachlor may be an EDC, blocking glucocorticoid signaling. Ongoing studies are investigating the effects of prolonged exposure to metolachlor and lead in mice.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #45**

# From Here to There: Transporter Expression through Tsetse Fly Development

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biology

Symbiosis is crucial for survival on nutrient-poor diets. Blood-feeding tsetse flies are the medically significant vectors of African trypanosomiasis. Their obligate symbiont, Wigglesworthia glossinidia, supplies vitamins essential to tsetse reproduction. Through its role in nutrient provisioning, Wigglesworthia impacts vector competence (the ability to maintain and transmit trypanosomes). Transporters mediate host-symbiont interactions, guiding metabolic exchanges. Here, highly expressed tsetse transporters (n=55) were identified within the symbiont-containing organ (i.e., bacteriome) of two evolutionary distant tsetse species, hypothesizing these transporters as critical towards symbiosis. Further, because Wigglesworthia demands fluctuate through tsetse development, transporter expression should reflect these alterations. To examine transporter expression, RNA was isolated from tsetse life stages, cDNA synthesized, and the expression of transporters—Na+/K+ ATP synthase alpha and ATPase beta subunits, aquaporin (regulating water distribution) and proton-coupled amino acid transporter—determined. Expected results include observation of differences in transporter expression between tissues (i.e., bacteriome versus gut), and life stages. Understanding the transporter mechanisms driving the tsetse-Wigglesworthia metabolic integration may provide insight to its influence on tsetse biology and novel targets for vector control.

**Funding:** National Institutes of Health (NIH)

**Program/mechanism supporting research/creative efforts:**
WVU SURE
KY-WV LSAMP, Henry W. Hurlbutt Memorial Research Award

**Presentation #46**

# Cloning of Bovine Agouti-Signaling Protein into pcDNA3.1/myc-HisA

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Animal and Nutritional Sciences

Agouti-signaling protein (ASIP), a 132 amino acid secreted protein, is expressed in the bovine ovary, oocyte, and early embryo. In adipose tissue, ASIP is a known regulator of insulin resistance and lipid metabolism. However, the role of ASIP in oocyte maturation and early embryonic development in cattle is currently unknown. In this study, the bovine ASIP coding region was cloned into pcDNA3.1/myc-HisA, a common mammalian vector. Following transformation into E. coli cells, single colonies were analyzed for the ASIP insert. Positive clones were inoculated into LB media for plasmid DNA isolation. Proper integration of the bovine ASIP insert into the pcDNA3.1/myc-HisA vector was confirmed by Sanger sequencing. In conclusion, ASIP has been successfully incorporated into a vector and replicated by bacteria cells to produce large quantities of purified plasmid DNA. Future experiments will include delivering the ASIP plasmid DNA into mammalian cells to isolate the recombinant ASIP protein to determine its effect on oocyte maturation and/or embryonic development in cattle.

**Funding:** USDA National Institute of Food and Agriculture Grant no. 2016-67015-24919

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #47**

# Chronic Stress Initiates Superoxide Production in the Liver of C57BL/6J Mice

**Anna Phillips*, Emily Burrage, Saina Prabhu, Tyler Coblentz, Tiffany Nguyen*, and Paul D Chantler**
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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biomedical Engineering

Chronic stress can be a foundation for many vascular diseases. Specifically, oxidative stress (the overproduction of free radicals such as superoxides) can potentially cause harmful long-term effects to the vasculature. This study focuses on making the connection between chronic stress and its effect on the production of oxidative stress. C57BL/6J mice were randomized into a unpredictable chronic mild stress (3 male and 3 female) or control (3 male and 3 female) group for 8 weeks. Mice were given multiple injections of DMPO within 24 hours of being euthanized. DMPO is a drug used to attach to superoxide in the body; essentially marking the oxidative stress for later visualization. The mice were euthanized, and liver tissues were collected for use in western blot analysis. The liver was selected as it is one of the largest sources of oxidative products. The analysis revealed that mice exposed to stress had elevated levels of liver DMPO vs. control mice. These data suggests that chronic stress induced an oxidative environment in the liver which can have implications on the vasculature.

**Funding:** NIH CoBRE Grant 5P20GM109098;BINP R56 NS117754-01 (PDC)

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #48**

# Identifying Proteasome Activators for Neurodegeneration

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Many neurodegenerative diseases, such as Alzheimer's are typically defined by the buildup of proteins such as amyloid-β and tau. Accumulation of protein occurs intracellularly and extracellularly, affecting neuronal functions such as synaptic plasticity, memory formation, and ultimately loss of neuronal connections. Normally, intracellular proteins are degraded by a molecular machine called the proteasome. Previous in vitro studies have shown that the proteasome can be impaired by neurodegenerative-associated proteins such as α-synuclein and amyloid-β when they fold in a particular conformation. The purpose of this study is to identify compounds that can activate the proteasome. The compounds being tested were discovered using a database that compared the structure of known proteasome activators. These compounds will be tested on proteasomes to characterize the compound's affinity, efficacy, and mechanism of activation of the 20s proteasome. Results of this study can determine if stimulating proteasome degradation can have a beneficial impact on neurodegenerative diseases and the degradation of their associated neurotoxic proteins.

**Funding:** National Institute of Health

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #49**

# The Effects of Dim Light at Night on Morphine Induced Analgesia

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** Biology

Circadian rhythms are endogenous biological processes that oscillate with a period of about 24-hours. These rhythms are synchronized to the environment through external cues, the primary of which is light early during the day. Light at night exposure is ubiquitous in modern society, affecting 80% of the global human population. Disruption of circadian rhythms induced by dim light at night (dLAN) exposure has been linked to numerous adverse effects, including pain hypersensitivity. The pain system is intrinsically driven by circadian oscillations, potentiating the vulnerability of the pain system to disruption induced by dLAN. The United States opioid epidemic has devastated the lives of individuals and families over the past 20 years. In 2019 alone, 10 million individuals abused prescription opioids and nearly 50 thousand died from opioid overdoses. Due to the intertwined nature of the circadian system and pain, we sought to examine the relationship between circadian rhythm disruption and opioid analgesia. We hypothesized that dLAN (5 lux) reduces the analgesic efficacy of morphine sulfate by dysregulating the endogenous opioid system.

**Funding:** NCCIH 1R21AT011238 (RJN)

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #50**

# Culturing Gastric Organoids for Microinjection of Helicobacter pylori

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**Field:** Biological Sciences
**Assigned Category:** Biological Sciences (Poster Presentations)

**Student's Major:** IMMB

Helicobacter pylori infection is linked to 90% of all gastric cancers and infects over 50% of the world's population. The in vivo gastric microenvironment is complex and constantly changing from interacting with the external environment and immune system. To better understand H. pylori and its effects on the stomach, 3D gastric organoids offer a controlled environment that closely reflects the gastric epithelium, by micro-injecting with bacteria the host-pathogen interaction is shown without immune interference. Our goal was to develop a protocol for culturing gastric organoids. We utilized a specialized cell line called LWRN, which produces Wnt3a, R-spondin 3, and noggin, factors required for gastric organoid growth, to condition culture media. WNT activity was confirmed with the Topflash luminescence assay. The organoids are capable of passaging and are sustained with the media. In future studies, we plan to microinject these organoids with H. pylori to study its effects on the gastric epithelium. Future findings from our organoid research will give theory and future hypothesis for the model in which H. pylori infection causes gastric cancer.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #51**

# Nano-Cu Decorated Polylactic Acid Nanofibers Produced by Centrifugal Force-spinning for Reusable Antimicrobial Respirator Filters

**Matthew W. Barre*, Kavin Sivaneri Varadharajan Idhaiam, Edward M. Sabolsky, Gloria Oporto, William Goldsmith, Jonathan Boyd, and Meenal Elliott**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical Engineering, Aerospace Engineering

In the aftermath of the COVID-19 pandemic, the need for improved personal protective equipment is paramount as the conventional respirator filters are non-reusable, retain limited long-term filtration efficacy, and are non-biodegradable. This project's objective is to produce and characterize reusable, antimicrobial, and fully biodegradable filters through centrifugal force spinning. Ecofriendly polylactic acid nanofibers were spun with an in-situ coating of copper nanoparticles to produce the multilayer respirator filters. The fibers are analyzed using scanning electron microscopy and x-ray diffraction analysis to quantify the average fiber diameter, quality, and the distribution of copper nanoparticles present on the fibers. The breathability and filtration efficacy of the multilayer filter were analyzed with a custom-built testing unit that meets NIOSH and OSHA standards. The filters produced show efficacy and breathability near the conventional N95 respirator efficiency levels, which is the industry standard for medical respirators. The goal is to find effective breathability, particulate filtration, and antimicrobial properties for the filters produced as well as satisfactory filter reusability.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #52**

# Wastewater-based Epidemiology a Tool to Track Community Spread of SARS-CoV-2

**Alexander E Brun*, Christopher Anderson, Brian Lemme, Brian Hendricks, Gordon Smith, Timothy Driscoll, and Emily Garner**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Civil and Environmental Engineering

Monitoring wastewater for genetic markers of disease has emerged as a valuable tool for tracking incidence of disease at the community level. Wastewater monitoring for RNA fragments associated with SARS-CoV-2 has been used around the world throughout the COVID-19 pandemic to track disease and provide warning for disease reemergence. The cooperation of public health professionals, governments officials, and researchers is essential to facilitate wastewater monitoring programs. This project aims to develop a network for monitoring SARS-CoV-2 in wastewater from communities throughout the State of West Virginia. To demonstrate the feasibility of this approach, a pilot project was conducted by collecting samples from the Star City wastewater treatment plant, in Morgantown, WV as well as from through the WVU campus. Samples of wastewater were collected via autosampler at selected sites in the areas and tested using droplet digital polymerase chain reaction (ddPCR). The presence of N1 and N2 genes of SARS-CoV-2 was found in wastewater. Results collected during the duration of the pilot project indicate that this project can be used on a variety of scales.

**Funding:** West Virginia Department of Health and Human Resources, Bureau of Public Health

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #53**

# Using Reflective Tape to Measure Treadmill Speed and Detect Perturbations with Infrared Motion-capture Cameras

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Biomedical Engineering

Tracking the change in length of the musculotendinous junction (MTJ) of the calf muscle can be an important factor in determining the response of the leg muscles to perturbations, or a loss of balance, while walking. This is especially important as the global lifespan continues to increase, leaving a greater population of elderly at risk for injuries from falling. Using a split-belt treadmill and ultrasound imaging, the MTJ was successfully imaged on human subjects while perturbations occurred. However, the differences between the MTJ during normal stance and perturbed stance cannot be properly ascertained without a means for determining the times at which perturbations begin and end. To solve this, reflective tape was placed on the outer edges of both belts of the treadmill, tracked in Vicon Nexus with motion-capture cameras, and a MATLAB code was written to analyze the position data to calculate the speed of the tape. The method proved to be successful overall, providing correct speeds that displayed perturbations as the tape accelerated and decelerated in sync with the treadmill.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #54**

# Implementation of a Convolutional Neural Network for Object Classification

**Cristian Cuevas-Mora* and Marjorie Darrah**
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**Field:** Mathematics
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mathematics

A Light Detection and Ranging (LiDAR) sensor is capable of collecting 3D data that can be used for object classification. The LiDAR data analysis process starts with detecting objects in the 3D set and then uses a Convolutional Neural Network (CNN) to try to recognize (or classify) these objects. Our study describes the implementation of the VoxNet CNN algorithm and how it
classifies target objects in a 3D set. The data collection was accomplished through the use of an unmanned aquatic vehicle with a 4D Tech Solutions RedTail LiDAR sensor, which was used to scan the seafloor to detect cables and other objects. To start the process we train the CNN on the seafloor data so it can classify several different objects. We want to be able to take a portion of the 3D LiDAR data and give a user the classification of the object within the data. The goal is to optimize this process to see how few data points are needed before a successful classification can be made.

**Funding:** Louis Stokes Alliances for Minority Participation, National Science Foundation

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #55**

# Drone Control Using Pixhawk and ROS

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Aerospace Engineering

Drones are very popular in applications that range from cinematography to precision agriculture and industry automation. The project purpose is to create and test an interface capable of control and give commands to an autonomous drone using a communication between a computer and the drone`s flight controller, named Pixhawk. With this interface the drone would be able to perform any flight task. These tasks include takeoff, return to home, land and waypoints navigations. To be able to perform those tasks, the drone's onboard computer needs to communicate to a ROS (Robot Operational System) node running in a remote computer using a protocol named Mavlink. In this project, it was used a simulator called Gazebo, where the code created was simulated in a virtual drone using Mavlink communication, before it is tested in the actual drone. In the simulation the drone performed all the tasks included in the interface that was created. In conclusion, it is possible to control perfectly a drone using Pixhawk while running a ROS code and communicate both using a Mavlink protocol.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
My efforts were mainly voluntary.

**Presentation #56**

# Applying artificial intelligent code to detect disturbances within power grid systems

**Chase Holley*, Morgan Holzman*, Vishal Verma, and Jignesh Solanki**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical and Aerospace Engineering

Artificial Intelligence (AI) helps to automate tasks that have previously required human interaction and intelligence. Our aim for this research is to develop software that can be integrated in power system operations for detecting external disturbance events in power delivery to consumers. Artificial Intelligence enables the analysis of large datasets by finding patterns which can help aid in answering some of the most complex problems. Power grid systems are complex with varying sizes and connection configurations which makes it hard to detect disturbances within the systems normal operating conditions. As a first step towards developing such software, we have developed the Artificial Intelligence software framework and are in the process to test this framework on 9 bus power grid systems. The objective is to increase the resiliency of power grid systems identifying disturbances so they can be mitigated before it creates the large-scale blackout such as the recent Texas blackout.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #57**

# Using Artificial Intelligence To Detect Oscillations In Power Grids

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical Engineering

Power oscillations are a phenomenon that occur in power systems that are potentially disruptive. These oscillations cause disturbances in the delivery of power to consumers. The development of artificial intelligence provides a potential answer to the problem that plagues power systems. To accomplish this, it needs to be determined whether an AI neural network is a feasible answer to this problem and if so, what scale will this be possible to be applied to? The baseline test to prove this concept will be done using data from the 9-bus test case by utilizing the Matpower software. This data will then be used to train an AI created using TensorFlow. This AI will be tested for accuracy in determining which bus there is a disturbance at, by being able to recognize which voltage outputs match certain inputs. This research is ongoing, but an accuracy above 80% would be considered acceptable for a standard AI neural network. The goal of system like this is to prevent future large scale blackouts, like the one that occurred in Texas.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #58**

# Using Anaerobic Ammonium Oxidation Coupled to Ferric Reduction (Feammox Bacteria) to Treat Domestic Wastewater

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Biomedical Engineering

Recently, research has been conducted regarding anaerobic wastewater treatment due to its benefits, including lesser energy consumption and cost efficiency. Anaerobic ammonium oxidation coupled to ferric reduction, known as Feammox, has been investigated in soil environments to evaluate the nitrogen cycle. In this study, the potential to apply Feammox bacteria towards nitrogen removal in wastewater was examined. The experimental design included two bioreactors with and without carbon-based organics, as well as an influent supply of iron solution. The ammonium, iron, and organic carbon were measured to quantify Feammox kinetics. Results indicated a 20% higher ammonium oxidation rate in the bioreactor without organic carbon compared to the bioreactor with organic carbon. Analysis of the microbial community showed a more thriving community of Feammox bacteria in the bioreactor without organic carbon. Thus, it can be concluded that an abundance of organic carbon may inhibit Feammox activity and therefore, nitrogen removal. The research findings are expected to help design biological wastewater treatment systems using this novel microbial pathway for nitrogen removal.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #59**

# A Framework for Controlling Robotic Swarms Using Bayesian Optimization and Linear Combination of Vectors

**Stephen Jacobs*, R. Michael Butts*, David Rubel*, Yu Gu, Ali Baheri, and Guilherme Pereira**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical and Aerospace Engineering

Interest in robotic swarm research has grown in recent years. In contrast to single-agent or multi-agent systems which often use complex centralized control schemes, robotic swarm systems often rely on local sensing and decentralized control schemes to accomplish complex tasks through emergent behaviors. In these systems, it is often very challenging to predict the outcomes of even the simplest control rules. We propose a generalizable control and optimization framework for decentralized direct-communicating robotic swarms. The proposed framework facilitates the discovery of control laws leading to emergent behaviors by simplifying the control policy to a linear combination of vectors and scalars which are collected from sensor inputs. The weights for each term in the control function are found by simulating the swarm system and optimizing a given cost function using Bayesian Optimization. Using this technique we are able to generate emergent behavior to suit a number of swarm tasks such as cohesion and segregation, and collision avoidance.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #60**

# Modeling and Designing Polyimide-Derived Carbon Molecular Sieve Membranes for Carbon Capture from Flue Gas

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Chemical Engineering

One of the chief concerns in the emergence of environmental accountability is the magnitude of pollution stemming from energy generation and industrial use of fossil fuels. As such, measures helping to curtail emissions of gases such as Carbon Dioxide (CO2) are soon to prove vital. A promising form of Carbon Capture and Storage (CCS) technology is that of membrane separations, specifically Carbon Molecular Sieve (CMS) varieties. These membranes show strong ability to separate difficult pairs of gases with extreme precision via their highly selective permeabilities, with the added potential of being more cost effective and energy efficient than traditional CCS systems. In this work, an entry level CMS system is modeled in MATLAB and used to separate a flue gas stream taken from a U.S. Department of Energy benchmark amine-scrubbing CCS system. The simulated model shows the membrane's ability to isolate CO2 from the mixture, with expected decrease in equipment and operational costs. The decrease in energy consumption and high degree of separation parameters suggest CMS membranes could be viable alternatives to conventional CCS systems.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #61**

# Renewable Energy Data Mapping and Integration for the PJM Region

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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Chemical Engineering

The PJM regional transmission organization oversees the movement of electricity to utilities

throughout the Eastern US. The growing emergence of alternative energy sectors requires location-specific weather and geological data to be studied in the optimization of these energy systems,

which is necessary in the greater response to global environmental issues. The goal of this research is to propose further integration of renewable resources in the Eastern US based on predicted fluctuations in weather patterns throughout the day, with interest in increasing renewable resource use in the region. To reach this goal, PJM data for load, wind generation and forecast, and solar generation and forecast was accessed through web application programming interface calls. The data was then written to OSI PI through server connections using the PI-SDK Library, where it can be mapped and studied on a single trend. Continued research will aim to analyze these resources on their power generation and feasibility. Limitations to this project include the withholding of utilities' locational information due to potential security issues surrounding renewable energy in the US.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #62**

# Free Market Economies as a Model for Robotic Swarm Foraging

**Nathaniel Pearson*, John Little*, Dillan Wilson*, and Yu Gu**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Computer Engineering

Robotic swarm foraging combines localized exploration of an environment with the global goal of returning gathered resources back to a collection site. Swarms are well suited to complex logistical problems like foraging because of the inherent robustness that emerges from their flat hierarchy and interchangeability. The potential applications of swarm foraging include search and rescue, trash removal, and planetary resource harvesting. The presented research describes a decentralized means of collaborative foraging based on a free market economy. Using decision processes derived from economic theory the individual agents buy and sell resources amongst themselves to maximize individual success, which is expected to also improve the swarm's success. By emphasizing individual decision making we expect emergent behaviours between agents to arise that allow the swarm to adapt itself to changing conditions. A discrete world simulation was created to test the effectiveness of our proposed model. The simulation results will be used to evaluate the proposed swarm foraging free market based model and to make comparisons to other methods that use non-collaborative strategies.

**Funding:** NSF, Award # 1851815

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #63**

# Varying Fracture Properties to Achieve Maximum Recovery of Natural Gas From Shale

**Thomas Prince*, Kashy Aminian, Samuel Ameri, and Mohamed El Sgher**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Petroleum and Natural Gas Engineering

The introduction of multi-stage hydraulic fracturing has allowed previously untapped oil and natural gas resources in shale to become productive. One such formation, the Marcellus Shale, has led the Appalachian region to become the top natural gas producer in the country. This study utilized a reservoir simulation software, known as CMG, to model these reservoirs and determine the most effective methods of extracting natural gas. Using this software, hydraulic fracture parameters can be used to replicate the real-world methods of extracting natural gas from these shale formations. The hydraulic fracture parameters were manipulated to determine the most efficient method of extracting the natural gas. The results showed that an increase in fracture half-length along with reducing the fracture stage spacing yielded the maximum gas recovery. Meanwhile, changes in fracture conductivity have an insignificant impact on the gas recovery. This information is essential to ensure that natural gas can be extracted most efficiently from shale formations. The extraction of these natural resources is essential to continue delivering power to our country and stimulate the regional economy.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #64**

# Elucidating tumor cell interactions with Cy5 in microfluidic tumor models using fluorescence microscopy

**Alexander Pueschel*, Kasey Freshwater, and Margaret Bennewitz**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Biomedical Engineering

Microfluidic tumor models (MTMs) are vital in vitro tools for efficacy and biocompatibility testing of novel therapeutics and imaging agents. Traditional techniques like 2D static monolayer cultures often fail to recapitulate the tumor microenvironment leading to less informed animal studies. High reproducibility and accurate recapitulation of dynamic in vivo environments allow MTMs to improve traditional testing processes prior to animal model use. This study utilizes idealized co-culture MTMs with a central tumor compartment consisting of porous interfaces connecting to a surrounding microvascular network. Tumor cells, stained with green cell-tracer and cultured within the central chamber, were perfused with Cy5 dye at 1.0μL/min for 1hr to evaluate tumor cell extravasation and uptake. The mean fluorescence intensity (MFI) per cell was determined via confocal fluorescence microscopy. Work moving forward will encompass tumor cells co-cultured with primary human endothelial cells under physiological flow to establish a complete, physiologically analogous endothelial lumen. Incorporating MTMs as standard scientific models in the field of diagnostics and therapeutics will better inform follow-up animal studies expediting the process and reducing overall costs.

**Funding:** Task 89

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #65**

# Differences in Reactive Muscle Recruitment Between Standing and Sit-to-Stand Perturbations

**Alyssa H. Reeves* and Jessica L. Allen**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Biomedical Engineering

When moving in day-to-day life, our bodies keep us balanced. Sometimes a disturbance occurs, causing a stumble and we have to recruit our muscles to prevent a fall. How we recruit our muscles depends on how off-balance the stumble puts us and what we were doing when we stumbled. We can examine the relationship between these stumbles and muscle recruitment in a controlled manner by perturbing subjects. Our goal is to find the differences between standing and sit-to-stand perturbations in terms of the muscles that prevent a fall. We analyzed eight subjects' lower leg muscles and calculated muscle activity immediately following the perturbation. Our results demonstrate that the Lateral Gastrocnemius was recruited the most after standing perturbations and the Vastus Lateralis has significantly less activity in the sit-to-stand perturbations, with all muscle activity increasing as the stumble difficulty increased. This study will help us understand how we stay balanced depending on the situation and help us target a specific muscle if a patient is struggling with gait or arising from a chair.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #66**

# Collision-Free Navigation of Robotic Swarms using Preferred Velocity Metrics and Time Prioritized Avoidance

**David Rubel*, R. Michael Butts*, Stephen Jacobs*, Yu Gu, Ali Baheri, and Guilherme Pereira**
*Department of Mechanical & Aerospace Engineering, West Virginia University, Morgantown, WV 26506-6045*

**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mathematics and Computer Science Dual Degree

Multi-agent collision avoidance requires a delicate balancing act between avoiding other agents and making progress towards a goal. Existing methods can already guarantee collision free trajectories, but their formulations often cause unnecessary stagnation when the number of agents increases. Furthermore, the metrics used to compare possible trajectories with the desired one are usually slow at making progress toward the goal. This study presents a novel approach for collision avoidance with a non-Euclidean metric for determining optimal velocities and dynamic restrictions that safely expand the possible velocities an agent can take. More specifically, the metric will heavily disincentivize any slowing or speeding up in the preferred direction of motion to maintain progress toward the goal, and the restrictions that prevent a collision will increase as the time until that collision decreases. Based on randomized waypoint navigation simulations, block paired data shows a 17% average improvement in time efficiency compared to the Optimal Reciprocal Collision Avoidance (ORCA) method, a widely accepted collision avoidance approach.

**Funding:** NSF, Award # 1851815

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #67**

# Evaluation of the effectiveness of hydrophobic coatings on ionic polymer–metal composite electronics

**Reese A. Steindler* and Allison M. Arnold**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical and Aerospace Engineering

Current soft robotic technologies lack compact and portable design configurations. Ionic-type electroactive polymers offer solutions to this dilemma as they are lightweight, flexible, and produce millimeter-level mechanical deformations in response to minimal electrical input. Therefore, practical development of ionic polymer-metal composites (IPMCs) would allow for the utilization of these materials in a multitude of environments and applications such as flexible electronic integrations, artificial muscles, wearables, and other biomimetic and biocompatible solutions. Unfortunately, the development of IPMC-based technologies has been limited due to the requirement for the polymeric core (Nafion) to be hydrated with water. By successfully encapsulating these thin films, IPMC hydration and performance can be maintained. This research seeks to investigate IPMC coating solutions and their impact on long-term performance in a multitude of conditions. Various parameters involved in coating IPMCs will be classified and measured for their effectiveness in thin, even application, moisture retention, and electrical interference. Optimal coating solutions will be defined from these results.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #68**

# Language on twitter: women in stem versus non-stem

**Karen Truong*, Janet L. Fraser, and Hannah E. Bailey**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Management Information Systems

Many language studies have been conducted between different genders; however, there is much to be investigated regarding language studies between different groups of the same gender. One approach to study within-gender differences was thought to be based broadly on career interest. Thus, we evaluated whether there was a difference between the way women of different fields (STEM versus Non-STEM) used language on social media. Because social media is one of today's primary methods of communication, we extracted text from Twitter pertaining to the aforementioned groups. Approaching our problem, we utilized Natural Language Processing (NLP) to process tweets and make use of the following techniques for analysis: word clouds, word lists, and sentiment analysis. Preliminary results indicate that, while there is no significant variation in sentiments (positive or negative emotions) between the two groups, women in STEM appear to utilize work-related vocabulary more commonly than women in non-STEM fields. With further investigation, we intend to apply emoji and hashtag-based analysis and dig deeper into our data to understand what differences may exist between these groups.

**Funding:** West Virginia University

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #69**

# External Interference on Autonomous Robotic Swarm

**Daniel E. Villarreal*, Di'Quan M. Ishmon*, Trevor R. Smith*, R. Michael Butts*, Xi Yu, and Yu Gu**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Aerospace Engineering

This study investigated a situation where a semi-autonomous adversary robot directly interacted with an autonomous robotic swarm to infiltrate a defensive waypoint. This was intended to mimic a real-life situation where robotic swarms are used in foraging tasks and security is a concern. In the simulation we created, a state machine was implemented to enable the swarm to complete foraging tasks assigned by the operator, and take up defensive formations towards the invader and/or the defensive waypoint. Once the adversary was detected by an agent, it utilized fluid flow kinematics and set a sink flow to the defensive waypoint. This allowed individual agents to decide whether to protect the defensive waypoint (sink) or pursue the invader (doublet). The Doublet formation enabled the swarm to funnel the invader towards one direction and continue wherever the invader struck. We simulated this for a visual representation of the state machine, the operator's way of assigning tasks, and to observe the emergent behavior that resulted during defensive formations that kept the invader from reaching the defensive waypoint.

**Funding:** NSF, Award # 1851815

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #70**

# Decentralized Robotic Foraging Through Local Interactions

**Dillan Wilson*, Nathaniel Pearson, John Little, and Yu Gu**
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**Field:** Engineering
**Assigned Category:** Engineering (Poster Presentations)

**Student's Major:** Mechanical Engineering

In nature, a few examples of local foraging interactions between collaborating agents are chemical pheromones and wiggle dances with ants and bees respectively. This research strives to replicate simple natural interaction rules for robotic swarms that lead to efficient decentralized foraging behavior. In this work, agents locally observe other agents traveling home while transporting a resource and change their movement to an opposing direction to increase their chances of finding resources.

Solving the robotic swarm foraging problem is important for applications such as search and rescue, environmental clean up, and planetary resource gathering. Swarms leverage collective intelligence to operate more efficiently than multiple non-collaborative robots and more flexibly than centrally organized robots by adapting to their environment.

Swarm foraging is not reliant on a single robot and remains robust to multiple unit failures. A simulation has been developed where the behavior of the swarm can be influenced by altering key robot parameters: range of wiggle motion, conformity, and conformity duration. These adaptable parameters can create emergent behavior to increase foraging efficiency depending on the environment.

**Funding:** NSF, Award # 1851815

**Program/mechanism supporting research/creative efforts:**
WVU Robootics REU

**Presentation #71**

# Regional Surveillance of Pseudomonas aeruginosa Epidemiology in Monongalia County, WV

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Pseudomonas aeruginosa is an opportunistic pathogen responsible for nosocomial infections in patients with underlying comorbidities and in immunocompromised individuals. Here, the prevalence of P. aeruginosa infections in West Virginia and associated comorbidities was determined from data derived from patients diagnosed with P. aeruginosa between 2008 and 2018 at Ruby Memorial Hospital. Diabetes, Cystic Fibrosis, heart disease, and cancer comorbidities were studied to determine relevance to P. aeruginosa infection. The incidence of P. aeruginosa infection and concurrent number of deaths was observed to be highest in children between ages 0-4. Within these patients, P. aeruginosa infections were primarily associated with diseases of the respiratory and cardiovascular systems, and congenital malformations. This distribution was different than the entire cohort, as diseases of the circulatory, endocrine, and respiratory systems were the most prevalent. Overall, the data obtained from this study highlights the importance of monitoring young, diabetic, or immunocompromised patients to prevent P. aeruginosa infections in these vulnerable populations.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #72**

# A realistic co-exposure scenario induces significantly high inflammation in lungs in NLRX1 dependent manner

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Air pollution is among the five leading causes of premature deaths and cardiopulmonary hospitalizations. Air pollution is a complex mixture of gases and particulate matter. Recent epidemiological studies indicate that these components synergistically interact to induce adverse cardiopulmonary outcomes. We hypothesized that a realistic inhalation co-exposure to constituents of air pollution (ozone and ultrafine particles of carbon black) can significantly alter the lung inflammation via NLRX1, a member of Nod-like receptor (NLR) family. We exposed Nlrx1+/+ and Nlrx1-/- mice to air(controls) or CB+O3(2.5mg/m3+1ppm) for 3 hours followed by sacrifice after 24 hours. We observed significant changes in lung inflammation, alveolar barrier damage, airway hyper responsiveness and lung function decline in Nlrx1-/- compared to Nlrx1+/+. Our studies demonstrated significant increase in inflammatory cells (neutrophils) in lavage, increased inflammatory gene (TNF-α, IL-6) expression and airway hyperresponsiveness in Nlrx1-/- mice post co-exposure with CB and ozone. In conclusion, we demonstrate that NLRX1 is involved in control of carbon black and ozone induced lung toxicity. Further studies are ongoing to evaluate signaling pathways implicated in these increased inflammatory responses.

**Funding:** NIH

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #73**

# The Effects of Wet Versus Dry Float on Heart Rate Variability

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Biomedical Engineering

Float Reduced Environmental Stimulation Therapy (Float-REST) has many known physiological and psychological benefits for participants such as reduced muscle tension pain, improved mental health, and overall well-being. The premise of wet and dry flotation-based therapies is to create an environment deprived of sensory stimulation via submersion of the participant into a soundproof, salt-filled tank or on top of a water-filled platform, respectively. Heart-rate-variability metrics provide key insight into an individual's parasympathetic tone, with specific regards to the rootmean-square-of-successive-differences (rMSSD), standard-deviation-of-NN-intervals (SDNN), high-frequency (HF), low-frequency (LF), and LF/HF ratio. The main purpose was to compare the difference between wet and dry therapies via objective measurements of heart-rate-variability using a Polar H10 device during the session, as well as blood pressure taken before and after each session, and subjective questionnaires. Subjects (N = 9) participated in all variables across all studies for eight-weeks. Preliminary data suggest that there was a significant effect of modality ($p = 0.0163$) in rMSSD throughout the entire length of the float sessions, however, this trend was not observed with the other metrics.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #74**

# Expression of the Y chromosome-encoded linc-SPRY3-2/3/4 increases after radiation in multiple cancer types.

**Brooke A. Brothers*, Emily S. Westemeier, and Ivan Martinez**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

With recent advances in the understanding of noncoding RNAs and the prevalent roles they play in carcinogenesis, the Y chromosome is a potential source for many unknown regulation pathways. Preliminary data has shown non-small cell lung cancer (NSCLC) cells have a positive correlation of expression of the Y chromosome with apoptotic activity and radiation sensitivity, and the Y chromosome-encoded linc-SPRY3-2/3/4 family has a positive dose- and time-dependent relationship with radiation treatment. We aim to expand these findings into many other cancer types to potentially discover similar regulation of linc-SPRY3-2/3/4 and radio-sensitivity. Multiple male cancer cell lines with and without loss of the Y chromosome (LOY) were irradiated, and after 72 hours qRT-PCR was performed to find Y chromosome-expressing cells had increased expression of linc-SPRY3-2/3/4 after radiation, while cells with LOY had minimal expression before and after treatment. If expression of the Y-chromosome and linc-SPRY3-2/3/4 in patient tumor samples can consistently indicate tissue radio-sensitivity, this could serve as an efficient tool in clinical testing/assessment of the most appropriate and effective treatments for individual male cancer patients.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #75**

# emm Types and Macrolide Resistance among Invasive Group A Streptococcus in West Virginia

**Chloe E. Chipman*, Lillie M. Powell*, Soo J. Choi, P. Rocco LaSala, and Slawomir Lukomski**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Certain emm types of group A Streptococcus (GAS) cause invasive diseases that result in trauma and death. Macrolide antibiotics are used to treat GAS infections, though growing resistance has been reported globally. Here, we investigated 40 invasive GAS (iGAS) isolates collected from patients at J.W. Ruby Memorial Hospital in 2020-2021 for emm types and antibiotic resistance. emm typing was performed by sequencing the 5'-end of the emm gene and using a BLAST search against a Centers for Disease Control and Prevention database, whereas erythromycin-resistance genes were detected by PCR. Two emm types 92 (n=28) and 11 (n=6) were predominant. Macrolide resistance among emm92 isolates was conferred by gene ermT harbored on an R plasmid, while emm11 isolates harbored chromosomally-encoded determinants ermA, ermB, and mefA. Single isolates represented emm types 22, 28, 82, 83, 87, and 197, with resistance determinants similar to emm11 isolates. These results showed patterns in antibiotic resistance according to emm type. This study and further research will be important in determining treatment for iGAS infections as antibiotic resistance evolves in the species.

**Funding:** WVU IMMB Internship, 12300771

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #76**

# Characterization of Stemness and Ciliation in Patient-Derived Glioblastoma Samples

**Caitlin Cowell*, Sila Yanardag, and Elena Pugacheva**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Integrative Biology

The primary cilia is a nonmotile, sensory organelle that extends from the membrane of most cell types. Loss of the primary cilia unlocks the potential for unlimited proliferation of cells by removing a key checkpoint in the G0/G1 phase of mitosis. Many human cancers exhibit loss of primary cilium, including glioblastoma (GBM). Glioblastoma is the most common and most aggressive primary, malignant brain tumor in adults. With no curative treatment option currently available, GBM is also the most lethal. Contributing to the high mortality rate of GBM is its tendency to reappear after surgical resection of the tumor due to the presence of a small population of cancer stem cells (CSCs). Utilizing techniques like western blot and immunofluorescence, my project aimed to characterize the stemness profile and ciliation status of patient-derived GBM samples and determine the relationship between the two. In agreement with the heterogeneity of GBM samples, results show variation among tissues for stem cell markers. Within GBM samples, preliminary evidence suggests that high expression of stem cell markers correlates with decreased ciliation.

**Funding:** Cancer Institute Summer Undergraduate Program

**Program/mechanism supporting research/creative efforts:**
WVU Cancer Research Fellowship Program

**Presentation #77**

# Targeting Immune Checkpoint Inhibitors to Cell-Surface Markers on Tumors

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Chemistry and Biology

Immune checkpoints consist of regulatory and inhibitory pathways that allow the immune system to respond to infection and cancerous cells. In cancer patients, negative T cell regulatory pathways are activated by malignant cells and anti-tumor immune responses are inhibited, allowing cancer cells to grow and spread throughout the body. Immune checkpoint inhibitors block these pathways to enhance the body's immune response against cancerous cells. This study aims to target immune checkpoint inhibitors to cell-surface markers on tumors to enhance the immune response in cancerous cells. Immune checkpoint inhibitors can be attached to malignant cells using antibodies and a resin. A linker molecule connecting the resin to the immune checkpoint inhibitor has successfully been synthesized, and another linker molecule to connect the antibodies to the resin is in the process of being synthesized through a series of reactions involving 6-(boc-amino) hexanoic acid, DOTA-tris(tert-butyl ester), and lanthanide metals. The effectiveness of directly targeting tumors using immune checkpoint inhibitors will be confirmed in future in vivo studies.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #78**

# Analysis of two routes of exposure of DFP to determine tissue cellular response

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Diisopropyl fluorophosphate (DFP) is a toxic substance that leads to seizures and death. It has been used worldwide as a pesticide and a chemical warfare agent mimetic, but research regarding tissue response is limited. This study aimed to comparatively analyze two routes of exposure of DFP, inhalation and subcutaneous injection of moderate and high doses, to determine the impacts in mice on tissue cellular responses. To do this, protein content in brain, heart, and lungs was analyzed using a bicinchoninic acid (BCA) assay. A two-way analysis of variance (ANOVA) was run to determine differences in protein concentrations between doses and administration route. No statistical significance was found for any comparisons. These results indicate that the administration route of DFP does not have a significant impact on protein concentration in an organ-dependent manner. Further, no differences were noted in protein concentration between high and moderate doses administered. More research is warranted into other tissues and the length of time post-administration. All safety and handling protocols were approved by WVU EHS and WVU ACUC.

**Funding:** SURE 12300771

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #79**

# Testing the antimicrobial properties of Bio-nano-composite PLA nanofibrils electrospun with copper nanoparticles.

**Brice Johnston*, Timmy Nguyen, N. Mubarak Albarakati, Kavin Sivaneri, Rakesh Gupta, Edward Sabolski, Gloria Oporto, and Meenal Elliott**
*1Department of Microbiology, Immunology & Cell Biology, 2Department of Chemical Engineering, 3Department of Material sciences and Aerospace Engineering, Benjamin M. Statler College of Engineering & Mineral Resorces 4Davis College of Agriculture, Natural R*

**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

We are testing the antimicrobial property of a biodegradable composite of polylactic acid (PLA) impregnated with copper nanoparticles fabricated using an electro-spinning process. We chose a gram-positive organism Staphylococcus aureus (SA) and a gram-negative Pseudomonas aeruginosa (PA) as examples of common pathogens associated with hospital acquired infections. The biofabric was produced by electro-spinning PLA nanofibrils without (PLA) or with copper nanoparticles (PLA-CuNano) under 4 different electro-spinning conditions. The results showed the 1.5sy fabric the most capable of inhibition when inoculated with S.A. Of the 4 different electrospinning processes, one resulted in a biocomposite of PLA-CuNano capable of complete elimination of both test organisms. The other 3 processes failed to produce a composite that could inhibit either organism to an acceptable level (2 Log reduction). Additional methods of fabrication of the biocomposite material are currently in progress. These include a forced spin process as well as a biocomposite consisting of cellulosic fibres impregnated with Copper nanoparticles.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #80**

# Synthesis and Purification of Novel mitoNEET Ligands, Therapeutic Potential for Neurodegenerative Diseases

**Riley Kane*, Scott Saylor, and Werner Geldenhuys**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Biochemistry

The outer-mitochondrial iron-sulfur [2Fe-2S] protein, mitoNEET, has shown increasing potential as a target for the treatment of neurodegenerative diseases, such as Parkinson's and Huntington's disease. Over 1 million Americans suffer from these two conditions each year; with no standard treatment currently in place, alternative receptor biology is being explored. Important regulatory factors involved in these diseases are the conformational changes of mitoNEET protein domains. Although the [2Fe-2S] function has not been isolated, ligand binding at or near this domain has considerable impact on mitochondrial energy transfer. Previous literature concludes that Thiazolidinedione (TZD) derivatives show excellent utility as mitoNEET warheads, and the presence of aromatic rings greatly increase binding affinity towards target domains. As targeting this protein for bioenergetic regulation is relatively unexplored outside of TZD derivatives, our focus for much of this research revolves around the condensation products of phenyl isocyanates/isothiocyanates and amines. While the testing of our compounds is ongoing, this report aims to outline our synthesis and purification methods for potential mitoNEET ligands, as to be used in subsequent in-vivo applications.

**Funding:** NIH Grant P20GM103434

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #81**

# DNA Methylation of IL-27α: A Target for Neonatal Sepsis Treatment

**Matthew Kays*, Cory Robinson, and Jordan Vance**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Neonatal sepsis continues to be a clinical burden due to its high mortality rate observed in the United States and abroad. Neonates have a unique immunological profile compared to adults that includes elevated expression of the immune suppressive cytokine IL-27. The work described here seeks to explore DNA methylation as a mechanism that regulates differential expression of IL-27 in early life compared with adulthood. We hypothesize that neonatal macrophages are deficient in methyl group donors available to methylate DNA and inhibit IL-27 expression. Macrophages were derived from monocytes harvested from peripheral adult blood and cord blood. These cells were then cultured with methionine or choline as methyl group donors, as well as a DNA methyltransferase inhibitor. The results demonstrated that, while methionine had only limited effect on IL-27 expression in neonates compared to adults, choline and DNA methyltransferase inhibitor treatments increased IL-27 expression. While this work is ongoing with additional experimental replicates planned, the results reveal interesting observations for how DNA methylation may be an important regulator of age-related IL-27 expression.

**Funding:** MICB Department

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #82**

# Transcription signature of CD138low/- Multiple Myeloma Cells

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Multiple myeloma (MM) is a hematological cancer characterized by malignant plasma cells (PCs) in bone marrow. While plasma cells normally express CD138, within the malignant plasma cells small populations with decreased or absent expression of CD138 -a surface marker of MM- are identified, known as CD138low/-. The contribution of these CD138low/- cells to myeloma relapse and drug resistance is still mostly unknown, however CD138low/- cells present as an immature stem-like population, potentially contributing to relapses and chemoresistance in myeloma patients In this study, we define the transcription signature of CD138low/- MM cells using RNA-Seq in MM.1S, hypothesizing that the two populations have identifiable differences in RNA expression. RNA-seq analysis identified 1,188 differentially expressed genes, and PrePC (CD138- ) populations from MM patient data share similar enrichment patterns with our CD138low/- data. Analysis with responsive genes from various treatments demonstrated resistance to Lenalidomide treatments and showed sensitivity to Melphalan treatments. These findings indicate that CD138low/- cells exhibit a distinctive transcription signature from the CD138+ cells and are linked to stemness and drug resistance.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #83**

# Accountable Health Communities Model Evaluation and Gap Analysis in West Virginia

**Ashley Linder1*, Hilary Payne2. Melanie Horn2, A. Brianna Sheppard1, Elizabeth Claydon1, Mike Broce3, Mary Emmett3, Lesley Cottrell1, Lori Brooks1, Carol Murphy1, Olivia Barbee1*, Alexa Harris1, and Bob Whitler2**

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Biomedical Engineering

The Accountable Health Communities (AHC) Model was developed by the Centers for Medicare and Medicaid Services to test whether addressing the social needs of their beneficiaries through screening at clinical sites and community navigation would improve their overall health and reduce healthcare spending. This model has been implemented at over fifty clinical sites in West Virginia and collected data for three years. The study purpose is to examine outcomes of the AHC Model in West Virginia to date and determine where improvements can be made to the model and the community infrastructure to better serve the needs of the beneficiaries. We will be analyzing the data collected from screening and navigation, reviewing the capacity of community service providers, and interviewing key stakeholders to assess the distribution of social needs and the communities' ability to resolve them. The results of this study can be used to inform screening and navigation practices in West Virginia and inform changes to policies or creation of new policies that facilitate beneficiaries' access to needed services.

**Funding:** Centers for Medicare & Medicaid Services

**Program/mechanism supporting research/creative efforts:**
WVU SURE
Centers for Medicare & Medicaid Services; WV Clinical and Translational Science Institute

**Presentation #84**

# The Protective Role of Monocytes in Stroke-Associated Pneumonia

**Linda Ma*, Kelly L. Monaghan, Wen Zheng, Shokofeh Rahimpour, and Edwin Wan**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Ischemic stroke leads to increased susceptibility to bacterial infection in the lungs, resulting in stroke-associated pneumonia (SAP). Monocytes are innate immune cells with critical roles in stroke-mediated inflammation and defense against bacterial infection; however, their role in SAP is not known. After inducing ischemic stroke in mice, our lab reported a significant increase of monocytes in the brain, not the lungs, despite monocyte chemoattractant CCL2 increasing in the lungs. We hypothesize that ischemic stroke alters monocyte distribution--monocytes are directed into the brain instead of migrating to the lungs, causing increased susceptibility to bacterial infection. We administered CD45.1+ monocytes into CD45.2+ mice infected with S. pneumoniae with/without stroke induction and determined the migration of CD45.1+ monocytes by antibody staining and flow cytometric analysis. Our data show that CD45.1+ monocytes were found only in the brains of the stroke mice. CD45.1+ monocytes in the lungs were reduced in mice with ischemic stroke induction compared to mice without stroke induction. Moving forward, we will determine whether direct administration of monocytes into the lungs facilitates bacterial clearance following stroke.

**Funding:** NIH, GM109098

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #85**

# Passive Stride-length Limiting Orthosis Causes Gait Asymmetry and Sensorimotor Adaptation in Humans.

**Jason Plants*, Emily Herrick, and Sergiy Yakovenko.**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Exercise Physiology

Different central and peripheral pathologies result in asymmetric walking that could further lead to musculoskeletal sequelae. To prevent further injury, we need to develop an effective intervention that promotes symmetric walking. We hypothesized that the constraining of stride length can induce motor adaptations. Furthermore, the rate of recovery from asymmetric gait to symmetric (baseline) gait could be manipulated by the use of adaptation with the opposing effect. Healthy adults (N=3, 22.3 ± 0.6 years) walked on a treadmill alternating between baseline symmetric walking and asymmetric walking imposed with a light exoskeletal constraint. An asymmetry index was created, and the participants walked in sequence of left leg preference, right leg preference, then unconstrained. When their gait patterns were placed on the asymmetry index, their gait was 44.4% more symmetric in the unconstrained condition than if they had walked in a sequence of left leg preference then unconstrained. This preliminary result supports both of our hypotheses and our idea that this novel intervention can be used in clinical populations with gait asymmetry.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #86**

# Emergence of Erythromycin Resistant emm92 Invasive Group A Streptococcus in West Virginia

**Lillie Powell*, Chloe Chipman*, Soo Choi, P. Rocco LaSala, and Slawomir Lukomski**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Group A Streptococcus (GAS) can cause diseases ranging from superficial throat and skin infections to life-threatening invasive (iGAS) infections. Penicillin is the drug of choice for treating GAS infections but the use of macrolides has dramatically increased due to penicillin allergies and convenience for clinicians, resulting in widespread erythromycin resistance. Recently, the emergence of emm92-type iGAS was reported nationwide. The purpose of this study was to examine GAS isolates from invasive infections in West Virginia by emm typing and to assess the modes of antibiotic resistance, using bioinformatics, molecular biology, and microbiology techniques. In a collection of 40 iGAS clinical isolates, collected at J.W. Ruby Memorial Hospital's microbiology laboratory during 2020-2021, a majority of the isolates were emm92. Alarmingly, all 28 emm92 strains were found to harbor a broad-host-range plasmid containing the ermT gene, reported as pRW35, which facilitates resistance to erythromycin and clindamycin. As the first WV study to categorize invasive GAS isolates, it is concerning that the majority of strains were emm92–type and showed resistance to often prescribed antibiotics, erythromycin and clindamycin.

**Funding:** WVU IMMB internship program 12300771

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #87**

# Single vape exposure on middle cerebral artery function over a 72-hour period

**Madison R. Robinson*, Amber Mills, Ally Kirk*, James Frazier, Paul Chantler, and I. Mark Olfert**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Exercise Physiology

Vaping is known to cause impairments in blood vessel function, but little is known about how long vessel dysfunction remains after vaping. We hypothesized that dysfunction would be evident in the middle cerebral artery (MCA) of the brain within 24 hours of vape exposure and recover by 48 hours. We measured MCA vessel reactivity in air-exposed (control) rats and in rats assigned to 2-, 24-, 48- or 72-hour groups following a single 1-hour vape exposure. E-liquid consisted of 50:50 propylene glycol: vegetable glycerin mix with no nicotine or flavoring. Compared to control, the greatest decline in MCA dilation (to either acetylcholine or sodium nitroprusside) was at 24-hours (-51%, $p<0.05$) and was restored by 72-hours post vaping (-5%, p=ns). Impaired MCA constriction to phenylephrine was greatest at 2-hours (-41% compared to control, $p<0.05$) and was restored at 72-hours (+2.6%, p=ns). Our data is important because it shows that a single vape exposure causes significant MCA dysfunction that peaks within 24-hours, but takes 72-hours for normal function to be fully restored.

**Funding:** NIH Grant R21 ES033026-01, U54-GM104942-05S1, P20GM103434 and HRD Louis Stokes STEM Pathways and Research Alliance: KY-WV LSAMP, 1826763

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #88**

# Sex Hormones, Sex Chromosomes, and Microbiome Interactions Influence Humoral Immune Responses to HKSP Immunizations

**Sabrina Siegan*, Kailey Smith, Quinn Hopen, Carly Amato-Menker, and Jennifer Franko**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Immunology and Medical Microbiology

Differences in immunological responses between males and females has been extensively studied. While sex hormones are known to contribute to sexually dimorphic responses, little is known about whether sex hormones interact with other sex-specific factors (sex chromosome complement and and gut microbiome) to influence immune responsiveness. Previously, our lab demonstrated that XX sex chromosome-dependent enhancement of heat-killed Streptococcus pneumoniae (HKSP)-specific immune responses was microbiome-dependent. Here we investigate if sex hormones also contribute to this XX-dependent phenotype. Ovariectomized (OVX) female four-core genotype (FCG) mice were immunized with HKSP in the presence or absence of an intact microbiome. One week post-immunization, antigen-specific serum antibody responses were assessed by ELISA. In contrast to previous results using intact animals, microbiome disruption did not reduce HKSP-specific IgM responses in female XX FCG mice, suggesting a potential hormonal influence. Future studies will confirm this influence and investigate the underlying mechanisms regulating these interactions. Identification of such immunoregulatory interactions that influence immune responses in a sex-specific manner will lead to the development of more effective vaccine and infection control strategies.

**Funding:** Immunology and Medical Microbiology Internship

**Program/mechanism supporting research/creative efforts:**
WVU IMMB Undergraduate Research Internship

**Presentation #89**

# Additional Examples of the Rare Anterior Fibulocalcaneus Muscle

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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Biology

The anterior fibulocalcaneus is a rare variant muscle located within the anterior compartment of the leg. Only found in <1% of specimens, the anterior fibulocalcaneus muscle arises from the fibula, passes anterior to the lateral malleolus and inserts into the fibular (peroneal) trochlea of the calcaneus. Since its initial discovery in 2010, the anterior fibulocalcaneus has been found in additional specimens as well as identified in magnetic resonance imaging (MRI). The presence of this variant muscle has clinical significance as it usually presents with lateral ankle pain from impingement. This variant is important to clinicians and radiologists when looking at radiological imaging, diagnosing, and treating patients presenting with pain anterior to the lateral malleolus. Up until this point, the anterior fibulocalcaneus has only been reported as bilateral. This paper presents the first reported unilateral presence of this muscle to our knowledge, confirms the innervation from the deep fibular (peroneal) nerve, and provides additional reports of this muscle bilaterally.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #90**

# Deletion of Tissue-Nonspecific Alkaline Phosphatase on Endothelial Cells Exacerbates Sepsis-Mediated Intestinal Hyperpermeability

**Andrew G. Strutz 1*, Allison L. Brichacek 2, and Candice M. Brown 2,3,4**
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**Field:** Health Sciences
**Assigned Category:** Health Sciences (Poster Presentations)

**Student's Major:** Music Performance (B.M.), Biology (B.A.)

Sepsis and septic shock begin with uncontrolled inflammation that can cause tissue damage and multiple organ failure. One of the most common sites of infection for sepsis is the gut. During sepsis the gut becomes hyperpermeable, which exacerbates disease. In order to reverse the hyperpermeability events that occur during sepsis, it is important to understand the role of intestinal endothelial proteins that can be potential therapeutic targets. Previous studies from our lab have shown that diminished enzymatic activity of tissue-nonspecific alkaline phosphatase (TNAP), is associated with the loss of endothelial cell permeability at the blood-brain barrier. To determine if TNAP also has a role in intestinal permeability, mice with conditional deletion of TNAP on endothelial cells or littermate controls were subjected to experimental sepsis. After 24h, mice were injected (iv) with fluorescent molecules ranging from 380 – 60,000 Da to assess intestinal permeability. Quantification of fluorescence in the duodenum, ileum, and colon demonstrated a novel role for TNAP in the regulation of intestinal permeability in sepsis.

**Funding:** National Institutes of Health NIH P20GM109098 and R01 AG068155

**Program/mechanism supporting research/creative efforts:**
My efforts were mainly voluntary.

**Presentation #91**

# Odor Sensitivity Effects in 5-HT1A Receptor Knock-down in Vinegar Fly Local Interneurons

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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Biology (B.S.)

Neuromodulation is a mechanism by which neural networks adjust behavior in response to input from stimuli. In most animals, neuromodulation plays a critical role in finding food, by deciding how information about odors is processed by the brain. Neuromodulation relies on neurons that interpret small pieces of information, known as the local interneurons. Here, we investigate the role of 5-HT1A serotonin receptor expression in certain local interneurons of Drosophila melanogaster (vinegar fly) brains, due to their structural similarity to human brains. Using an established assessment known as the "T-Maze" and RNA interference, we evaluated the odor perception of vinegar flies with reduced 5-HT1A receptor expression in certain local interneurons while using apple cider vinegar as a stimulus at concentrations of 1:10 and 1:100. Both concentrations yielded participation and performance index averages with no significant differences between the control and experimental genotypes ($p>0.05$), meaning these receptors might not play a large role in odor perception. Results like these could help us understand the neural mechanisms of the vinegar fly and, subsequently, better understand the human mind.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #92**

# Examining the effect of stress during puberty and pregnancy-related hormones on the PVN transcriptome

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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Neuroscience

Women who undergo pubertal stress are at risk for future mental health impairments such as postpartum depression and altered stress responding. We have shown that allopregnanolone, a hormone produced during pregnancy, is both necessary and sufficient in producing a blunted stress response phenotype in pubertally-stressed mice. Separately, we found that pubertal stress led to upregulation of immediate early genes (IEGs) in the paraventricular nucleus (PVN) of pregnant mice. Here, we hypothesized administration of allopregnanolone would increase IEG expression in the PVN of pubertally stressed mice. Experimental group female mice underwent 14 days of chronic variable stress (CVS). All animals were given two separate injections of either allopregnanolone or vehicle treatment before collection. Gene expression in the PVN was measured using qPCR. We expect to see an increased amount of IEGs only in allopregnanolone-treated CVS mice, which would suggest that allopregnanolone is the component of pregnancy underlying the upregulation of IEGs. These results will provide novel insight into the mechanisms underlying female-relevant risk factors for stress dysregulation, a central endophenotype of affective disorders.

**Funding:** NICHD grant HD091376

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #93**

# Optimization of Multiphoton Imaging for Quantification of Cerebral Microvessel Permeability in Murine Ischemic Stroke

**Chloe G. Hernandez*1, Briana L. Clary2,3, and Candice M. Brown2,3**
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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Neuroscience and Psychology

Ischemic stroke encompasses ~85% of all strokes. Multiphoton (MP) microscopy is commonly used for acute and chronic imaging of brain tissue through a cranial window preparation. Fluorescently labeled cerebral microvessels are employed in MP imaging to assess real-time changes in blood-brain permeability, vascular remodeling, and inflammation. Since MP imaging is a new technique that will be implemented in our laboratory, the goal of this study was to optimize imaging parameters for MP imaging to study longitudinal changes in ischemic stroke. First, we optimized cranial window placement surgery to facilitate chronic MP imaging. We will then use the photothrombotic stroke (PTS) model, which mimics a permanent ischemic stroke, and fluorescent molecular dyes to elucidate the cerebral microvascular changes that occur in ischemic stroke. Another tool we have developed facilitate imaging of fluorescent cerebral microvessels is a mouse that expresses the tdTomato fluorescent marker in endothelial cells. Taken together, these tools will allow us to study the role of tissue-nonspecific alkaline phosphatase as a regulator of cerebral microvessel permeability in ischemic stroke.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
Louis Stokes STEM Pathways and Research Alliance: KY-WV LSAMP

**Presentation #94**

# Circadian disruption effects on vascularization in the hippocampus following cardiac arrest

**Evan W. McCray*, O. Hecmarie Meléndez-Fernández, and Randy J. Nelson**
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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Exercise Physiology

Circadian rhythms are essential to optimize biological function. These ~24 h endogenous rhythms are entrained to precisely 24 h by light. The prevalence of light at night has adverse effects on physiology and health. To determine the effects of dysregulated circadian rhythms on vascularization after ischemia, we hypothesized that circadian disruption delays revascularization following ischemia. Female and male mice underwent cardiac arrest (CA) or a sham procedure. They were then housed in either a light-dark (LD) cycle of 14 hours of light and 10 hours of dark, ordim light at night (dLAN) for 1wk. After 1wk, they were all housed in dark nights for another week. After 14 days we visualized vasculature within the hippocampus by staining with lectin. Females exposed to dLAN reduced vascularization in the CA2 and dentate gyrus regions of the hippocampus, which was exacerbated by CA. Males displayed vascular differences in the dentate gyrus in response to dLAN, but not in response to CA. These data suggest that circadian disruption exacerbates recovery after ischemia in the hippocampus.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #95**

# Characterizing Opioid Receptor Modulation of Monoamine Transporters: A Potential Avenue for Treating Neuropsychiatric Diseases

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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Biology

Depression, obsessive-compulsive disorder, and attention-deficit/hyperactivity disorder are but a few neuropsychiatric conditions that can be alleviated by drugs that target monoamine transporters (MATs). MATs are responsible for the reuptake/clearance of serotonin, norepinephrine, and dopamine in the synaptic cleft. In the brain, MATs can be co-expressed with one or more of the three opioid receptors (KOR, DOR, and MOR). We sought to determine whether opioid receptor (OR) co-expression with MATs affects monoamine transporter activity. Cells expressing a MAT without an OR exhibited robust uptake of a fluorescent substrate; however, cells expressing a MAT with either KOR or DOR (but not MOR) displayed a marked decrease in substrate uptake. These data suggest that KOR and DOR each negatively affect MAT activity. Future experiments will investigate whether KOR and DOR affect MAT expression levels and whether KOR and/or DOR physically interact with MATs. These findings may shed light on the use of KOR- and/or DOR-targeting pharmaceuticals to treat neuropsychiatric illnesses involving MAT activity.

**Funding:** This work was funded in part by NIH/NIDA U18DA052497 (to VS) and NIH/NIDA R36DA051703 (to ANW). ANW acknowledges support from NIH/NIGMS T32GM132494.

**Program/mechanism supporting research/creative efforts:**
Other
Neuroscience/Vincent Setola & WVU SURE

**Presentation #96**

# The Impact of Stress During Puberty on the Developing Hypothalamus

**John M. Mendoza*, Karissa N. Gautier*, Gretchen C. Pifer, Rachael B. Gandee, Samantha L. Higley, Brianna M. Karem, Casey A. King, and Kathleen E. Morrison**
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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Neuroscience

Excessive adversity during puberty can lead to negative outcomes within the brain. We have shown that stress during puberty leads to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis stress response. Using a mouse model, we have shown alterations in the paraventricular nucleus of the hypothalamus (PVN), which initiates the HPA axis stress response. Pubertal stress resulted in an increase in six immediate early genes (IEGs) in the PVN of stressed, pregnant mice in comparison to non-stressed pregnant mice. While these changes have been measured in adulthood, the timeframe for these changes is unknown. We examined the developmental trajectory of IEG expression in the PVN immediately after pubertal stress. Mice were exposed to chronic variable stress, or not, from PN21-34. At PN35, brains were collected from non-stimulated animals. The PVN was collected by micropunch, RNA was isolated, and qPCR was performed to quantify IEGs. Understanding the altered trajectory will uncover whether pubertal stress leaves an immediate mark on the brain. This mouse model provides opportunities to understand the molecular underpinnings of the risks for stress dysregulation.

**Funding:** NICHD Grant HD091376

**Program/mechanism supporting research/creative efforts:**
Other
NSF LSAMP & WVU SURE

**Presentation #97**

# Comparing Spiking Neural Networks to Rate Models in Biological Computations

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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Biomedical Engineering

This research sought to compare the different approaches to neural networks and their ability to handle dynamic biological systems; specifically, central pattern generators of locomotion in humans. The brain and body are made of dynamic systems that change in response to themselves and external inputs. As a result, these systems are not easily explained or computed mathematically. One approach is by using neural networks, a computer simulation, which can represent dynamic systems, either through a systematic input of data (i.e., Artificial Neural Networks) or through a dynamic change of inputs over time (i.e., Spiking Neural Networks). Both artificial and spiking neural networks are advantageous when working with biological computations due to the similarity in structure. Noise was added to the extrinsic input data and the adaptability between the models was compared. We found that spiking neural networks were more biologically plausible and more adaptable to noise because of the synapse value that acts as a low-pass filter. Such simulations are important for the further understanding of how biological systems work.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #98**

# The Role of Zinc Transporters in Brain Function

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**Field:** Neurosciences
**Assigned Category:** Neuroscience (Poster Presentations)

**Student's Major:** Biology B.S.

Zinc is an essential element for life, and deficiencies are associated with many health issues. Free zinc ions are involved in signaling and are released through transporters by certain cells, including neurons. One category of zinc transporters is Zrt-, Irt-related proteins (ZIP) which play a role in neurotransmission. ZIP12 is one of these proteins and is highly expressed within the brain. It is hypothesized that ZIP12 is involved in removing zinc from the synaptic cleft into astrocytes. Astrocytes are glial cells that support signaling and express ZIP12. While we know that zinc is co-released with glutamate, the clearance of zinc is completely unknown, and the relationship between ZIP12 and astrocytes may explain this. Using high-resolution microscopy, we have for the first time localized ZIP12 protein expression to determine how ZIP12 proteins relate to astrocytes. A high concentration of ZIP12 near astrocytes supports the hypothesis that ZIP12 moves zinc into astrocytes, which leads to a better understanding of the role this protein has in brain functioning.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
WVU MD/PhD Summer Research Internship Program

**Presentation #99**

# Testing the Effectiveness of the DSPIRA Radio Telescope for Public Use

**Victoria Blanton* and D.J. Pisano**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Astrophysics

Radio astronomy can be an expensive and inaccessible activity which can discourage its exploration and popularity. The DSPIRA radio telescope is designed by Greenbank Observatory, the NSF, and WVU. Materials used are publicly available, have varying price ranges for all components, and have options of self-construction or pre-built for certain, more complex components. The total price will average under $300 after all required purchases. After completion, we will make a digital neutral hydrogen (HI) map which will be compared with pre-existing maps to test its accuracy. Through HI detection, we can measure the rotation and relative weight of the Milky Way while locating HI clusters that suggest future star formation. This contributes to our understanding of how our galaxy moves and evolves. With the success of the radio telescope project, we hope to contribute to the study of astronomy while encouraging others to take an interest in its increased availability.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #100**

# Site-selective C-5 trifluoromethylation of N-8-quinolinyl benzamide using a nickel catalyst

**Carter Boger*, Shannen Lorraine, and Jessica Hoover**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Biochemistry

Trifluoromethyl (-CF3) groups are one of the most utilized functional groups in medical and agricultural chemistry due to their ability to increase lipophilicity and decrease metabolic breakdown of organic molecules. However, its addition typically requires molecules to be pre-functionalized with a leaving group, which increases cost, chemical waste, and complexity during chemical synthesis. Direct trifluoromethylation is possible by combining metal catalysts with directing groups such as N-8-quinolinyl benzamide, but usually at the cost of reaction specificity, resulting in unwanted biproducts. In addition, the quinoline backbone itself is difficult to functionalize using this method. This research explores a highly selective nickel-catalyzed trifluoromethyl functionalization of N-8-quinolinyl benzamide in the carbon-5 position, which has yet to be reported in the literature. Our current methodology focuses on optimization of reaction conditions including catalysts, bases, solvents, and oxidants required to synthesize 5-(trifluoromethyl)-8-quinolinyl benzamide. In the future, this research may allow for the development of new cross-coupling reactions that can be used to functionalize heteroarenes with a broad scope of substrates.

**Funding:** NIH grant R15 GM126514-01

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #101**

# Microfiber Alignment in Stamp Edges for Physical Fit Comparisons

**Colton Diges*, Zachary Andrews, Meghan Prusinowski, and Tatiana Trejos**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Forensic Chemistry

Postage stamps are important evidence for investigations of mail-related crimes as they may provide an association between a letter and a suspect. Stamps have reproducible edges, so edge appearance cannot be used to identify a single source. Instead, current practice is to examine both stamp edges for potential aligning microscopic fibers. Stamps that fit together are assumed to have microfibers that continue across the edge, while non-fitting stamps would not. However, this assumption has yet to be demonstrated in literature.
This study developed a systematic method to determine the location and number of aligning microfibers between stamps. 100 pairs of stamps were blindly evaluated by two independent examiners, and the performance was assessed along with the distribution of observed microfibers. Overall, the average number of fibers in a fitting pair was 53 (± 39), much higher than non-fitting pairs with an average of 2 (±2). The accuracy of the two examiners was 94-96%, with a misidentification rate between 2-8%. These findings indicate that microfiber orientation alignment with appropriate thresholds can support the examiner's opinion.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #102**

# Survey of Glass and Paint in the General Population to Assess their Evidential Value

**Olivia C. Duffett*, Lauryn C. Alexander, Oriana Ovide, and Tatiana Trejos**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Forensic Chemistry

Glass and paint are common types of trace evidence encountered at crime scenes such as burglaries, homicides, and vehicular crimes. Additionally, these traces may be encountered in daily activities, yet minimal information exists concerning their frequency in the general population. In this study, up to six garments from 100 random members of the Morgantown population were sampled during the winter season using taping (clothing) and scraping (footwear) methods. Various microscopic techniques were employed to identify glass and paint fragments. Overall, 13 glass fragments and 118 paint fragments were recovered from the 511 items examined. Glass fragments were predominantly located on footwear's soles (54%), while the majority of paint fragments were located on the upper surface garments (34%). Only 10% of the individuals bore glass fragments while 48% had paint particles. No more than 5% of the individuals had both glass and paint residues, providing valuable information to compare evidence found on potential suspects. This study provides valuable background information for the interpretation of paint and glass evidence in forensic investigations.

**Funding:** National Institute of Justice # 2019-DU-BX-0015

**Program/mechanism supporting research/creative efforts:**
My efforts were mainly voluntary.

**Presentation #103**

# The Role of Electrostatics on Huntingtin Oligomer Membrane Binding: Implications for Huntington's Disease

**Rachel Hankin* and Justin Legleiter**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry; Molecular Biology

Huntington's Disease (HD), a fatal neurodegenerative disease, is caused by expansion of a polyglutamine repeat segment in the huntingtin protein (htt). This expansion leads to aggregation into oligomers and fibrils. Htt associates with lipid membranes in cells, which influences aggregation and results in membrane disruption associated with toxicity. Understanding this membrane interaction can lead to novel therapeutic strategies for HD. To determine the role of htt oligomers in membrane-binding, oligomers were stabilized with peptide-based fibrillization inhibitors. These peptides were derived from the first 17 amino acids of htt (Nt17), a lipid binding domain that can be used to alter the overall charge of the oligomers. The peptides were phosphorylated or acetylated to mimic known post-translational modifications of htt that are naturally-occurring in cells. The ability of the peptides to stabilize oligomers was verified by atomic force microscopy. Based on a PDA binding assay, increasing the anionic character of oligomers decreased the interaction of oligomers with membranes. As aggregation can interfere with the PDA signal, a sedimentation assay was developed to confirm these results.

**Funding:** NSF CHE-1852369

**Program/mechanism supporting research/creative efforts:**
WVU Chemistry REU

**Presentation #104**

# The Effect of Observatory Localization in Pulsar Timing Searches for Gravitational Waves

**Alexandra N. Higley*, Sparrow R. Roch*, Maura A. McLaughlin, and Manjari Bagchi**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Physics and Astronomy

With the use of Pulsar Timing Arrays (PTAs), Gravitational Waves and Multi-Messenger astronomy can one day be better understood. To detect gravitational waves with PTAs we must take into account our position in the galaxy, solar system and earth. As such, the accuracy of the observatory position used to correct measured pulse times of arrival is crucial, and any discrepancy in said position that might manifest itself as background noise in gravitational wave analysis needs to be ruled out. Here I present the results of incrementally moving the observatory position by computational means and how that affects the measured physical parameters of each pulsar. We determine that only at large offsets in distance do we see any significant change in measured stellar attributes, however there is still change nonetheless. Taking into account interesting outliers and the distortions of data that happen with a varied observatory position, it is still necessary to perform a full gravitational wave analysis on this data to rule out error in observatory position as a source of possible noise.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
Other
Astrophysics IRES

**Presentation #105**

# Identification of Hydroxyzine hydrochloride Utilizing Electrochemistry and Time-Resolve Raman Spectroelectrochemistry On Screen-Printed Electrodes.

**Kendra Kelly*, Alexis Wilcox, Colby Ott, and Luis Arroyo**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Forensic Chemistry

Hydroxyzine, a piperazine antihistamine, is frequently utilized due to its analgesic and antianxiety effects for the treatment of allergic and inflammatory reactions and in cancer patients in conjunction with opioids. Hydroxyzine can mimic the analgesic effects of morphine and may potentiate the effect of opioids, leading to its use as a diluent in seized drugs of abuse. In addition, when >3-4 times the therapeutic dose is taken, it may lead to the potential of acute psychosis. Electrochemical and spectroelectrochemical analysis for this drug can provide a rapid, sensitive, and cost-effective detection platform. This electrochemical study of hydroxyzine was carried out in a dibasic sodium phosphate buffer at pH 9.5 using both differential pulse voltammetry (DPV) and square-wave voltammetry (SWV) using screen-printed carbon electrodes (SPCE). The spectroelectrochemical study was carried out in a 0.1 M perchloric acid solution on silver electrodes. Results of these studies showed limits of detection in the low parts-per-billion range, with R2 values>0.99 and %RSD values<10%. Orthogonal detection between the two methods provided improved reliability and sensitivity of this important drug.

**Funding:** National Institute of Justice #2019-DU-BX-0030

**Program/mechanism supporting research/creative efforts:**
Other

**Presentation #106**

# Nickel Mediated Decarbonylation of Phthalimides

**Jessica L. Kernaghan,* Rebekah C. Krupa, and Jessica M. Hoover**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry

Decarbonylative cross-coupling of aryl compounds has been reported through the application of stoichiometric amounts of nickel complex to form new C-C coupled products, such as the coupling of N-substituted phthalimides with aryl boronic acids. However, nickel catalyzed decarbonylative cross-coupling has only been achieved with diaryl ketones using directing groups to prevent the formation of stable nickel-carbon monoxide complexes. This research focuses on the addition of an 8-aminoquinolinyl to N-substituted phthalimides to determine if catalysis could be achieved through the addition of a directing group. Both stoichiometric and catalytic versions of decarbonylative cross-coupling reactions using N-Phenylphthalimide and N-(8-Quinolinyl)phthalimide were performed for comparison. In both cases, stoichiometric nickel decarbonylative cross-coupling of the N-substituted phthalimides proved to have higher yields than the catalytic versions of the reactions. In particular, the stoichiometric N-(8-Quinolinyl)phthalimide reaction yielded the desired cross-coupled product in addition to the protodemetallated byproduct. Preliminary analysis of the catalytic quinolinyl reaction indicated cross-coupling may have occurred. This would indicate that the addition of a quinolinyl directing group to the N-phthalimide results in catalytic activity.

**Funding:** CHE-1852369

**Program/mechanism supporting research/creative efforts:**
WVU Chemistry REU

**Presentation #107**

# Multivariate Analysis of Variance to Identify Instrumental Parameters Affecting Tandem Mass Spectra Reproducibility

**Jacob R. King* and Glen P. Jackson**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry

Standard methods for compound identification use algorithms to match an unknown mass spectrum to one in a database. Current algorithms are limited in their success because uncontrolled fluctuations in instrumental parameters create variance in peak abundances in mass spectra, and these spectral differences can make it difficult to distinguish structurally similar compounds. Therefore, our ability to understand the sources of variance seen among replicate mass spectra can lead to improved instrument control or better algorithms. To further understand the causes of variance, three sets of replicate spectra were collected in a five-factor, three-level full factorial set of experiments on an Agilent 6538 UHD QTOF, using cocaine as a model compound. Two notable cocaine fragments at m/z 82 and m/z 182, representing the low and high mass-to-charge ions, respectively, were monitored. Results showed that the collision energy and fragmentor voltage were responsible for the most variation in the recorded abundances of the ions, and skimmer voltage and capillary voltage were both responsible for a moderate amount of variance. The drying gas temperature was responsible for the least variance. This data should help to inform the community about the relative influences of mass spectral parameters.

**Funding:** NSF CHE-1852369

**Program/mechanism supporting research/creative efforts:**
WVU Chemistry REU

**Presentation #108**

# Ionized Gas in Cygnus X

**Riley Owens* and Loren Anderson**
*Center for Gravitational Waves and Cosmology, West Virginia University, Morgantown, WV 26506*

**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Astrophysics, Physics

Massive stars emit large amounts of hard ultraviolet radiation which ionizes their surrounding environment. The interplay between these stars and their locale is important in understanding galactic evolution, but poorly understood at small, individual scales. To help inform these gaps in our knowledge, we present radio observations from Cygnus X, a nearby, highly-active nebula riddled with massive stars and surrounding regions of ionized gas. Because of its proximity and the large size of many of its ionized regions, it offers observations of the morphology and dynamics of these environments in excellent angular resolution. We characterize these environments using recombination emission observations from a large (~60 hours) survey from the Green Bank Telescope, supplemented by past radio surveys. In particular, we use GaussPy+, a Python machine learning algorithm for fitting Gaussian emission features, to decompose hundreds of thousands of spectra to identify key features such as emission intensity, velocity dispersion, and bulk velocity of the ionized gas on a fine scale.

**Funding:** NSF Award #1950617

**Program/mechanism supporting research/creative efforts:**
WVU Astrophysics REU

**Presentation #109**

# Finding New Radio Pulse Candidates With GREENBURST

**Susie Paine*, Jordan Stanley*, and Duncan Lorimer**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Physics with Astronomy

Bursts of radio waves mark many astrophysical phenomena, including pulsars, Fast Radio Bursts (FRBs), and Rotating Radio Transients (RRATs). While pulsars are relatively well understood, both FRBs and RRATs need more data. Finding transient phenomena is often a matter of luck. A telescope needs to point at the right portion of the sky at the right time. Telescope hours are hard to get, so a more efficient strategy for acquiring observing hours is to piggyback off of other people's observations. If someone is viewing a galaxy when a burst occurs, that burst can be examined, in addition to the intended object. GREENBURST is an instrument on the Robert C. Byrd Green Bank Telescope that analyses all radio observations to find bursts. These bursts are run through a pipeline to determine the most probable candidate events. We then matched those candidates to known pulsars, FRBs, and RRATs. So far, 30,244 candidates have been found, leading to 7,686 matches. Future work will include sorting through promising candidates that don't have a match to discover potential new objects.

**Funding:** NSF Award AAG-1616042

**Program/mechanism supporting research/creative efforts:**
WVU Astrophysics REU

**Presentation #110**

# Catalytic and medicinal chemistry of novel boron-fluorine functionalized drug-like molecules

**Alexis Ravenscroft*, Randika Abeysinghe, Mason Hamilton, and Brian Popp**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry

Boron-containing compounds are a commonality in organic chemistry and are fundamental, especially for Suzuki-Miyaura cross coupling. Trifuoroborates have had some studies in the research community, however, difluoroborates have not had as much synthesis attention. Difluoroboralactonates are in a category all on their own, yet to be analyzed and tested and their potential is completely unknown. While synthesizing the compound, the generality of the reaction and the methodology were studied in attempt to optimize the reaction. This was done by working with different solvents, varied substrates and multiple purification methods to find the optimal combination. NMR spectroscopy was used to analyzing and characterizing the product to affirm the presence of the desired compound. After verifying the compound, the next part of the experiment focused on the common, Nobel prize-winning Suzuki Cross-coupling reaction with an aryl electrophile. Preliminary catalytic results show the expected disappearance of the difluoroboron moeity and introduction of a new carbon-aryl bond forming the 2,3-diarylpropionic acid.

**Funding:** NSF Career: CHE-1752986

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #111**

# Evaluating GC-MS and LC-MS Efficacy for Characterization of a Developed Organic Gunshot Residue Standard

**Declan Revenew,* Courtney Vander Pyl, William Feeney, and Tatiana Trejos**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Forensic Chemistry

Organic gunshot residues (OGSR) originate from the ammunition propellant during the discharge of a firearm and are released as vaporous mixtures of explosives, plasticizers, and stabilizers. OGSR transfer and persistence influence the interpretation of this type of evidence; therefore, investigating post-deposition trends can strengthen the understanding of these traces while improving collection methods. Historically, studies have been conducted by sampling individuals after discharging a firearm, limiting precision by the random, unknown quantity of OGSR deposited during a firing event. This project aims to study OGSR persistence on surfaces in a systematic approach using characterized standards as ground truth. The validation and comparison of two analytical techniques (GC-MS, LC-MS) is presented for eight common compounds (nitroglycerin, 2,4-dinitrotoluene, diphenylamine, methyl centralite, ethyl centralite, akardite II, 2-nitrodiphenylamine, and 4-nitrodiphenylamine). Results showed that LC-MS had superior LODs and LOQs, but some analytes were only detected by GC-MS. Furthermore, analysis of variance (ANOVA) shows the stability of the standard over a week (3-time intervals) was not affected by solvent type (ethanol or acetone) during preliminary studies by GC-MS.

**Funding:** National Institute of Justice; Award No. 2018-DU-BX 0186 and RS-Cx-0009

**Program/mechanism supporting research/creative efforts:**
Other

**Presentation #112**

# Transition Metal-Lanthanide Bonded Single Molecule Magnets Featuring High Spin Transition Metal Centers

**Amanda Reynolds* and Brian Dolinar**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry; Mathematics

Single molecule magnets (SMMs) act as electron spin-driven information storage devices and have a substantial amount of storage space compared to that of current magnetic hard drives. Current SMMs consists of anisotropic lanthanide ions (e.g. Tb3+, Dy3+) and bulky organic ligands that enforce an axial coordination geometry to maximize magnetic anisotropy. The metal ion anisotropy results in a thermal barrier to spin flipping, allowing them to exhibit magnetic memory behavior, but these compounds only act as SMMs at low temperatures. One of the main problems with current SMMs is their propensity to undergo quantum tunneling of the magnetization (QTM), which circumvents the thermal barrier to spin flipping. Introducing magnetic exchange coupling into these compounds has been shown to suppress QTM and improve SMM behavior. This research aims to maximize exchange coupling in SMMs by synthesizing Dysprosium (III)- Manganese (0) compounds with a high spin transition metal-lanthanide bond and bulky amide ligands. The multi-step synthesis of the ligand has successfully been completed, and the process of attaching this ligand to a transition metal is in progress.

**Funding:** NSF, CHE-1852369

**Program/mechanism supporting research/creative efforts:**
WVU Chemistry REU

**Presentation #113**

# Nickel-Catalyzed Nitration of 8-Benzamidoquinoline

**Jacob Smothers*, Andreas Baur, and Jessica M. Hoover**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry, Biology

C-H functionalization is an important technique for synthesizing compounds that would otherwise be difficult to produce using traditional methods. Due to the presence of many C-H bonds available for activation, traditional methods, which involve the use of both nitric acid and sulfuric acid, lead to mixtures of products and can be ineffective for producing specific isomers of a desired compound in high yields. Catalytic systems allow for milder conditions and greater ability to produce one specific isomer in relatively high yield. In this study the nickel-catalyzed nitration of 8-benzamidoquinoline is used to examine the role of different nickel sources in the selective C-H activation of 8-aminoquinoline derivatives. A number of different nickel sources as catalysts were screened in acetonitrile in the presence of pivalic acid, tert-butyl nitrite, and N2 gas. From this study, it appears that a number of different nickel sources are able to serve as effective catalysts for the nitration of 8-aminoquinoline derivatives. Additionally, some nickel sources are more selective than others, and some produce higher yields of the desired product.

**Funding:** National Institutes of Health

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #114**

# Searching for Fast Radio Bursts in Messier 82

**Jordan Stanley,* Susie Paine,* and Duncan Lorimer**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Physics

Fast Radio Bursts, also known as FRBs, are bright electromagnetic pulses of astrophysical origin. Since their discovery in 2007, over 700 FRBs have been documented, yet there is still relatively little known about them. One of those detections was successfully traced back to the Galactic magnetar SGR 1935+2154, where magnetars are a subclass of neutron stars that have magnetic fields approximately 1,000 times stronger than neutron stars. Starburst galaxies, like Messier 82 (M82), have a very high rate of star formation. This suggests that M82 should in principle have a relatively high density of magnetars. Taking this hypothesis, we are currently using Green Bank Observatory's 20-meter radio telescope to search for FRBs in M82. The project is still ongoing, and after ~17 days of observation, no verifiable FRB detections have been made. We currently expect to find at least one FRB by the time ~30 observation days have been reached.

**Funding:** Research Corporation for Scientific Advancement RCSA COTTRELL SCHOLAR SEED (ID#24299)

**Program/mechanism supporting research/creative efforts:**
WVU Astrophysics REU

**Presentation #115**

# Synthesis of Illudalic Acid and Inhibition Activity of LAR Subfamily

**Caitlin Thebeault,* Bobby Gaston, and Gregory Dudley**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Chemistry

Currently, there are no FDA approved chemotherapies or stimulant therapeutics that target the LAR subfamily of protein tyrosine phosphatases (LAR-PTPs) even though established roles in diabetes, stimulant addiction, and a variety of cancers are present. A lack of selective chemical inhibitors has led them to be deemed as "undruggable", until illudalic acid emerged as the first selective inhibitor of the LAR-PTPs. Synthetic approaches toward illudalic acid are notably lengthy and low-yielding and need to be improved to fully discover its therapeutic potential. Herein, we prepared illudalic acid in six steps (13% overall yield) as a vinyl-bromo-beta-keto amide was prepared in three steps, and used in a novel copper-catalyzed benzannulation reaction creating the illudalog core. A partial reduction of the Weinreb amide, followed by acid catalyzed lactonization yielded the natural product, Illudalic Acid. Preliminary assays indicate that illudalic acid was a rather potent inhibitor of LAR with an IC50 of 52 10 nM.

**Funding:** NSF REU Grant CHE-1852369 and NIH Grant P20GM103434

**Program/mechanism supporting research/creative efforts:**
WVU Chemistry REU

**Presentation #116**

# Predicting Low Energy and Stable Spherical Allotropes of Transition Metals by Metaheuristic Methods

**Nathaniel Wesnak* and Aldo H. Romero**
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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Physics

Nanostructures have seen a great deal of interest in the study of materials due to their unique chemical properties and the increase in our computational ability to find them. In particular, the excellent optical, catalytic, and electromagnetic properties of metals have led to them being used widely as the building blocks for nanostructures. Force-field equations are empirical methods used to describe structures of atoms and can be exploited computationally to find their ground states. These force-fields tend to favor solid structures though, and it has been shown through various studies that hollow structures can be used as improved replacements to their solid counterparts in certain applications. Here, we propose a method of finding these stable hollow structures by using a genetic algorithm, which uses heuristics based on evolution such as mutation to find the global minimum of a function. By modifying the potential equation with new forces, we allow the typically solid ground states to take on a hollow geometry. Preliminary results show that certain equations can produce hollow structures when used with specific parameters.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

*2021 Summer Undergraduate Research Symposium*
*West Virginia University*

**Presentation #117**

# A Quicklook Notebook for Analysis of NANOGrav Pulsar Data

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**Field:** Physical Sciences
**Assigned Category:** Physical Sciences (Poster Presentations)

**Student's Major:** Astronomy and Astrophysics

NANOGrav is a collaboration of scientists that times rapidly rotating neutron stars called pulsars in order to detect gravitational waves, ripples in spacetime produced by accelerating massive objects. Used by NANOGrav, Quicklook is a Python Jupyter notebook used to quickly visualize pulsar observation data. The Quicklook program can be run on files from a pulsar observation and generates graphs showing various features. Among its many purposes, Quicklook is most commonly used for detecting any unusual astrophysical events or any problems that might have occurred during observation. In our project, we are expanding the Quicklook Jupyter notebook by adding two new graphs displaying different aspects of the observation. One of the graphs shows any variation in the intensity profile of a pulsar from average results. The second plot graphs values of the dispersive delay, caused by travel through the interstellar medium, to allow for any major changes to become apparent. These additions will help NANOGrav scientists in the future see any intensity or dispersive delay changes more rapidly, to enable more rapid follow-up observations.

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**Program/mechanism supporting research/creative efforts:**
WVU Astrophysics REU

**Presentation #118**

# Raising awareness about catalysis through public outreach digital platform

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**Field:** Human Engagement* (See definition to the side.)
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** Hospitality and Tourism Management, Anthropology

Educational videos are facilitating information and knowledge distribution. While technology through such visual form can enhance learning, it is important that its effective distribution is fully monitored for pertinent assessment of its impact.
The goal of this research experience was to develop a YouTube channel for knowledge dissemination on catalysis. To achieve proposed goal, 6 animated lessons were recorded for a total video content time of about 100 minutes; conversational style doubled by enthusiasm were used to encourage listeners to directly integrate with presented information. Active learning strategies, guiding questions and pertinent, interactive animations were also embedded. Subsequently, a YouTube channel was developed, and lessons were actively posted; meta-analysis of the viewing and total access time are to be integrated to evaluate and monitor user access while a comments section is to be used for collecting feedback and recommendation. It is the vision that this developed platform would be seen as an active tool to promote active learning and user engagement.

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**Program/mechanism supporting research/creative efforts:**
Other
Cerasela Zoica Dinu & WVU SURE

**Presentation #119**

# Investigating the Reliability of the Dyadic Emotion Coding System (DECS)

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**Field:** Social and Behavioral Sciences
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** Psychology

A primary component of Parent-Child Interaction Therapy-Toddler (PCIT-T) includes caregiver-child emotion coaching (Girard et al., 2018). Emotion coaching helps parents deal effectively with child emotions and improve child emotion socialization (Zinsser et. al., 2021). PCIT-T would benefit from a robust and precise behavioral observation coding system to measure changes in caregiver-child emotion language. The Dyadic Emotion Coding System (DECS) was constructed to capture parental emotion language consisting of a three-part code scheme including the type of statement, type of emotion, and emotion intensity. To capture reliability, 6 caregiver-child dyads (3,039 discrete verbalizations, 198 DECS codes) were double-coded to assess for reliability. Data came from a randomized-controlled trial investigating the efficacy of PCIT-T. Participants included caregivers and their young children (i.e., 12-24 months). As an essential component of psychometric evaluation, reliability estimates quantify the consistency or precision of a measure. Overall agreement was almost perfect between two coders, $\kappa$=.837, $p<.001$. Thus, the DECS represents a promising measure in evaluating the efficacy of PCIT-T for teaching positive emotion socialization strategies to parents.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #120**

# Exploration of Cognitive Impairment Variability in Patients with Opioid Use Disorder

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**Field:** Social and Behavioral Sciences
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** Biology

It has been estimated that people with opioid use disorders (OUD) experience, on average, 3-6 non-fatal overdoses, causing brain abnormalities and neurocognitive impairments. An opioid overdose causes decreased respiration and without rapid medical intervention, the brain can injure due low oxygen. This project's aim is to identify factors that may explain variable neurocognitive functioning in patients with OUD such as risky drug behaviors, polysubstance use, and overdose circumstances. This study is a secondary analysis of a case control study (n=69) of neurocognitive impairments associated with opioid-related overdose. The primary outcome variable is cognitive impairment (CI) measured using the fully corrected NIH Cognition Toolbox Battery, a standardized instrument used to evaluate cognitive functioning across domains which are often impaired in substance users. Stata SE Version 15 will be used to analyze the data. Descriptive statistics will summarize the participant characteristics and multi-variable logistic regression used to model factors associated with CI. The confounding factors known to be associated with CI are variable and further research is needed to determine risk gradients for substance use and overdose.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #121**

# American Exceptionalism After 9/11: Dominant Narratives in Foreign and National Security Policy

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**Field:** Social and Behavioral Sciences
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** International Studies and Economics

After a decade of peace and prosperity following the end of the Cold War, the events of 9/11 challenged the dominance of US global leadership, uniquely positioning the Bush administration to cultivate a narrative of stability that Americans so desperately wanted. The administration was able to successfully establish a dominant narrative rooted in long-established American political tropes, which provided a strong sense of ontological security and promised material benefits. This narrative, American Exceptionalism, further specified three constituent tropes: leadership, hawkishness, and protectionism. These narratives were used to justify and build domestic support for American foreign and national security policy post-9/11. However, the events preceding and occurring during the invasion of Iraq weakened the ontological security argument and called into question any promised material benefits, challenging the administration with public resistance. I test this by hand coding speeches and statements from members of the Bush administration to identify the presence of the constituent tropes and supporting my findings with public opinion polling to illustrate the decline of support for the administration's policies and the narrative's collapse.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #122**

# Russia's Foreign Policy: The Role of Ideology

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**Field:** Human Engagement* (See definition to the side.)
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** International Studies and Political Science

Russia is a large, powerful state that has taken a more aggressive approach in international relations recently (eg. the annexation of Crimea) so it is important to understand their foreign policy process. The current government in Russia is comprised of many prominent individuals with different ideologies. We hypothesize that these ideologies influence Russia's foreign policy and are interested in how these ideological effects work. In this first stage of our new project, we are interested in identifying influential organizations and individuals so that we can understand the effects of ideas on foreign policy and the decision making process. Our work focuses on finding these organizations/individuals in the secondary literature using databases such as JSTOR. Since this is a new research project, we do not have any definitive conclusions yet.
**Funding:**

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**Presentation #123**

# The Impact of Non-Volitional Sexual Interaction on Sexual Agency in Adolescent Women

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**Field:** Social and Behavioral Sciences
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** Psychology

Due to gender socialization, which often encourages women to take on relational and communal roles in society, women may be more likely to fall victim to sexual coercion in order to please or to avoid conflict with their partner. It was hypothesized that adolescent women who experienced more unwanted sexual interactions would report diminished levels of sexual autonomy, and increased levels of sexual anxiety. The sample included 273 women between 18-22 years old. A Pearson r correlation was conducted to examine the relationship between the number of non-volitional sexual interactions experienced and perceived levels of sexual autonomy and anxiety in adolescent women. Results revealed that higher frequencies of non-volitional sexual encounters were correlated with decreased sexual autonomy and increased sexual anxiety. Another correlation was conducted to examine the relationship between sexual autonomy and communal traits, but results did not yield significant findings. By understanding the threat that non-volitional sexual encounters pose on sexual agency, we can begin to motivate others to practice consent in a way that serves to protect sexual agency.

**Funding:** SURE Undergraduate Research Program

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #124**

# Women in Community Engagement: Do Higher-Earners Have Stronger Perceptions of Community Involvement?

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**Field:** Social and Behavioral Sciences
**Assigned Category:** Social & Behavioral Sciences (Poster Presentations)

**Student's Major:** Sociology and Women's and Gender Studies

Previous research shows higher-earning community members are more likely to be involved in community development activities than their lower-earning peers, in part due to resource distribution and access. Community engagement allows people to form connections with their peers as they work to create positive tangible change within their communities. However, women and Appalachia are two underrepresented groups within social science. Few research studies have centered Appalachia or assessed the impact of women as community leaders. This paper relies on longitudinal survey research to explore differences in community engagement attitudes amongst Appalachian women by examining the intersection of income and gender. Analyzing the role of intersecting identities is important to sociological research because people of different statuses have different experiences within their communities. This research separates Appalachian women leaders into two categories based on income. Statistical analysis software STATA is used to evaluate survey responses of local women leaders based on how strongly they feel their community engagement efforts benefit their communities.

**Funding:**

**Program/mechanism supporting research/creative efforts:**
WVU SURE

**Presentation #125**

# Characteristics of Soil that Affect the Erosion of Reclamation Impoundments

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**Field:** Engineering
**Assigned Category:** Agricultural & Environmental Sciences (Poster Presentations)

**Student's Major:** Civil Engineering

This research's goal is to find what characteristics of soil have the greatest impact on how fast a hill or hillslope erodes. The Water Erosion Prediction Project (WEPP) is a program that allows the user to recreate hillslopes and then simulate the erosion of that hillslope over time with its given characteristics. Using WEPP, the desired hillslope was modeled with 2.4, 4 and 5 percent slopes and then put through a series of 100 simulated storms. For better accuracy, varied versions of each of the hillslopes were used. WEPP showed that the percent composition of sand, the rill erodibility and the effective hydraulic conductivity of the hillslope had the greatest effect on soil loss. Results of this project will have implications for reclamation practices.

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