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Programs

Undergraduate Spring Symposium

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2017

## 2017 Symposium Brochure

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# UNDERGRADUATE SPRING SYMPOSIUM 2017

APRIL 8, 2017  
MOUNTAINLAIR BALLROOMS

Saturday April 8, 2017  
Mountainlair Ballrooms (2nd Floor)  
Mountainlair at WVU

## Schedule of Events

- 11:30-11:55 a.m. Poster Setup — Undergraduate presenters arrive, register, and put up posters.
- 12:00-12:55 p.m. Lunch — Free lunch for all undergraduate presenters. Be sure to obtain your Treats-On-Us coupons.
- 1:00-3:00 p.m. Poster Presentations — Free and open to all and concurrent with any judging. All are welcome: parents and prospective students, research advisors, graduate students, undergraduate participants, and general public.
- 3:00-3:15 p.m. Closing Remarks
- 3:15 p.m. Poster Take-Down — Any posters remaining after 3:30 pm will be removed by the staff

## Symposium Sponsors and Organizers

WVU Honors College: <http://www.honors.wvu.edu/>

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Eberly College's SpeakWrite: <http://speakwrite.wvu.edu/>

American Chemical Society Student Affiliates (ACS-SA): [wvuacssa@gmail.com](mailto:wvuacssa@gmail.com)

Intercollegiate Biochemistry Program: <http://biochemistry.wvu.edu/>

Biochemistry Student Club

***We want to take this opportunity to thank our undergraduate presenters. Their willingness to present and discuss their research is greatly appreciated!***

***In addition, special thanks to all of our faculty research mentors. Research and creative experiences 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!***

## Poster Index

Poster 1 *Computational Simulations of Premixed Flame Oscillations in Obstructed Micro-Pipes*

**Amanda Cathreno**,\* Abdulafeez Adebisi and V'yacheslav Akkerman (Engineering)

Poster 2 *Direct Writing of Titanium Dioxide Photoanodes for Dye Sensitized Solar Cells*

**Domenic Cipollone**,\* Lynnora Grant\*, Maria Torres and Kostas Sierros (Engineering)

Poster 3 *Improving Solder Joints Formed in a Microgravity Environment*

**Matt Eberspeaker**,\* Robert Wilson\*, Raymond Nevling\*, Timothy Bear\*, Reiker Bowles\*, Anthony Fucello\*, Magdalena Krasny\*, Joel Lindsay\*, William D. Moon IV\*, Mitch Notarnicola\*, Hannah Bartlett\*, Aaron Dunkle and John Kuhlman (Engineering)

Poster 4 *Analysis of 3D Printed Titanium Rocket Nozzle*

**Timothy Fritz**,\* Aaron Dunkle, Wade Huebsch and Jay Wilhelm (Engineering)

Poster 5 *Titanium Dioxide Foam for Direct Writing Thin Structures*

**Lynnora Grant**,\* Domenic Cipollone\*, Maria Torres and Kostas Sierros (Engineering)

Poster 6 *Engineering Design for Mobile Brain Imaging Helmet – AM-PET*

**Matthew McHugh**,\* Garret Carden\*, Samantha Melroy, Thorsten Wuest and Julie Brefczynski-Lewis (Engineering)

Poster 7 *Modeling and Optimization of the Sabatier Reactor for Fuel Production on Space Missions*

**Eilish Miller**,\* Brent Bishop and Fernando Lima (Engineering)

Poster 8 *Mobility System of Planetary Rovers*

Yu Gu, Cameron Wilson\* and **Colin Osborn**\* (Engineering)

Poster 9 *Enhancing the Properties of Polymer-Silica Composites for CO<sub>2</sub> Capture*

**Igor Pereira**\* and Gifty Osei-Prempeh (Engineering)

Poster 10 *Upgrading of Bio-oil from Miscanthus Pyrolysis*

**Jordan W. Lewis**\* and Gifty Osei-Prempeh (Engineering)

Poster 11 *Biosynthesis of Dihydroergot Alkaloids by Genetic Modification of the Fungus *Neosartorya fumigata**

**Stephanie Arnold**\* and Daniel Panaccione (Biochemistry)

Poster 12 *Inhibition of glioblastoma multiforme tumors following exposure to N-(3,4-dichlorophenyl)-N-methylpropanamide (NMeDCPA)*

**Kensey Bergdorf**\* and John Barnett (Biology)

Poster 13 *Interactions Between Circulating MicroRNA Expression and Hormonal Control of Reproductive Function in Aging Rats*

**Jared Clapper**,\* Elizabeth B. Engler-Chiurazzi, Sara E. Lewis, Ryan Lamb and James W Simpkins (Biology)

**Poster 14 High Fructose Corn Syrup-55 Promotes Triglyceride Accumulation and Alters Fat Metabolism in the Liver**

**Sundus S. Lateef**,\* Kaitlin Mock, Vagner A. Benedito and Janet C. Tou (Biology)

**Poster 15 Functional redundancy of OVOL and GRHL genes in the suppression of the Epithelial-to-Mesenchymal Transition**

**Joseph A. McGuire**,\* Elizabeth Duarte, James T. Boothe, James H. Fugett and Alexey V. Ivanov (Cancer Cell Biology)

**Poster 16 Comparative investigation of a novel chemotherapy for metastatic brain cancer**

**Rachel Tallman**,\* Neal Shah and Paul Lockman (Biology)

**Poster 17 Influence of E-Cigarettes on Vascular Function**

**Stuart A. Clayton**,\* Evan DeVallance, Kayla W. Branyan, Christopher Pitzer, Matthew Breit, Hannah Hoskinson, Brett H. Erdreich, Powsiri Klinkhachorn, Paul D. Chantler and Mark Olfert (Medicine)

**Poster 18 Organisms Found On Endotracheal Biofilms**

**Christina Cox**,\* Jane Wade and Dana Gray (Medical Laboratory Sciences)

**Poster 19 Topical Antiseptic Applications Decrease Staphylococcus aureus Biofilm on Orthopaedic Metals: But is it Enough?**

**Emily P. Ernest**,\* Anthony S. Machi, Brock A. Karolcik and Matthew J. Dietz (Medicine)

**Poster 20 Electronic Cigarette Expectancies in Adolescents: Exploring the Relation between Smoking Status and Beliefs**

**Hayley Harman**,\* Desireé Williford, Lisa Hynes, Paul T. Enlow, Evan Turner, Pamela Murray, Christine Banvard-Fox and Christina L. Duncan (Psychology)

**Poster 21 Condom Use Satisfaction and Embarrassment in Females Currently Receiving Treatment for Opioid Use Disorder**

**Tanisha Hendrix**,\* Jonathan Stoltman and Julie Patrick (Psychology)

**Poster 22 Music Therapy and Pediatric Oncology**

**Patricia Smith**\* (Music Therapy)

**Poster 23 Auditory Damage Risk during Video Games in Two Players**

**Rachael Kauffman**\* and Vishakha Rawool (Audiology)

**Poster 24 Inter-professional Program to Enhance Micronutrient Knowledge in Dietetics and Medical School Students**

**Rachel G. Newman**\* and Megan Govindan (Nutrition)

**Poster 25 Opioid Substance Abuse Among Occupational Therapy Patients in West Virginia**

**Evan Pivont**,\* and Randy P. McCombie (Occupational Therapy)

**Poster 26 High Tunnels: Starting from the Ground Up**

**James McClain**\* and Eugenia Pena-Yewtukhiw (Agriculture)

Poster 27 *Recombination Lines of HII Regions*  
**Ryan P. Culp\*** and Loren D. Anderson (Astronomy)

Poster 28 *Rapid Realization of the Stochastic Gravitational Wave Signal due to Galactic Mergers* **Trey McNeely\***  
 and Sean McWilliams (Astronomy)

Poster 29 *Search For Fast Radio Bursts In Rotating Radio Transients Survey*  
**Robert Wilson\*** and Maura McLaughlin (Astronomy)

Poster 30 *Effects of Salinity on Germination of Industrial Hemp (Cannibas sativa)*  
**Chloe Courtade,\*** Lanjun Deng and Louis McDonald (Biology-Plant Sciences)

Poster 31 *Wide Band Artificial Pulsar Dispersive Transmission Line Project*  
**Jakob DeLong,\*** Stephen Melsom,\* Ashley Mullins,\* Lucas Runyan,\* Austin Schrauder,\* Natalia Schmid, Luke  
 Hawkins and Vereese VonTonder (Engineering- Radio Astronomy)

Poster 32 *Understanding Change in Tree Ring Growth Over Time Without Using Methods of Detrending*  
**Emily Bushman\*** and Amy Hessler (Environmental Studies)

Poster 33 *Nanocellulose Modified Adhesives to improve the Bond Strength of Plywood*  
**Royce Durgin\*** and Gloria Oporto (Wood Science and Technologies)

Poster 34 *Identifying the Antimicrobial Efficacy of Nanosilver in the Treatment of  
 Intracellular Staphylococcus aureus*  
**Krystal A. Hughes,\*** Jason Kang, Jabeen Noore and Bingyun Li (Nanotechnology)

Poster 35 *Petrography and Geochemistry of Megacrystic K-Feldspars from a Granitoid Intrusion, Northwestern  
 Nevada*  
**Holly Pettus\*** and Kenneth Brown (Geology)

Poster 36 *Study of the Transfer and Persistence of Glass in a Mock Kidnapping Case*  
**Katrina Rupert,\*** Mandy Ho\* and Tatiana Trejos (Forensic Science)

Poster 37 *Food Security and Substance Abuse of College Freshmen*  
**Rachel A Wattick,\*** Makenzie L Barr; Rebecca L Hagedorn; Karla Shelnutt, Anne Mathews, Sarah E Colby, Tracey  
 Barnett and Melissa D. Olfert (Nutrition)

Poster 38 *Hagstrum's Theory on Auger Emission for Metal Oxides*  
**Manaswi Daksha\*** and F. Julian Schulze (Physics)

Poster 39 *Discrimination of Illuminance by Sprague Dawley Rats*  
**Kaleigh Alkire,\*** Cory Whirtley, Forrest Toegel and Michael Perone (Psychology)

Poster 40 *Preference for Single vs. Multiple Reinforcer Presentations*  
**Sarah A. Brady,\*** Anthony C. Oliver and Kennon A. Latta (Psychology)

Poster 41 *Effects of Race-Based Rejection Sensitivity on Stress and Depression in African Americans*  
Daniel McNeil, **Deja Clement,\*** Remy Black and April Highlander (Psychology)



Poster 42 *The Effects of Changes in Reinforcer Magnitude on Resurgence*  
**Matthew T Klocke**,\* Anthony C. Oliver and Kennon A. Lattal (Psychology)

Poster 43 *Discriminative Stimulus Control by Three Different Sources*  
**Brittany Wood**,\* Tyler Nighbor, Kennon A. Lattal and Brian Katz (Psychology)

Poster 44 *Ergot Alkaloid Production in Agriculturally Important *Metarhizium Fungi**  
**Caroline E .Leadmon**\* and Daniel G. Panaccione (Agriculture and Biochemistry)

Poster 45 *Cultivation of *Haemonchus contortus* to the adult stage in vitro*  
**Brenton Mays**,\* Javier Garza and Scott Bowdridge (Agriculture- Parasitology)

Poster 46 *Evaluating Parasite Resistance in Terminal Sheep Breeds*  
**Curtis Patton**,\* Scott Bowdridge and Javier Garza (Agriculture)

Poster 47 *A Search for Fast Radio Bursts in Archival Green Bank Telescope Drift Scan Data*  
**Anika H. Rowe**,\* Peter Gentile and Maura McLaughlin (Astronomy)

Poster 48 *Identification of Sorghum and Foxtail Millet Genotypes to Study Saline Tolerance in Cereal Grasses*  
**Rachel E. Bainbridge**,\* Ashley Henderson and Jennifer S. Hawkins (Biology)

Poster 49 *Genetic variation in *Dip5*, an amino acid permease, regulates glyphosate resistance in *S. cerevisiae**  
**Audrey Biega**\* and Jennifer Gallagher (Biology)

Poster 50 *Determining Hybridization and Population Distribution of two Rail Species by using Molecular Techniques*  
**Jessica Bland**,\* Stephanie Coster, Lauren Schumacher and Amy Welsh (Biology- Conservation Genetics)

Poster 51 *Striped Coralroot: An Investigation into the Potential Divergence of two Californian Populations*  
**Anna French**,\* Craig F. Barrett and Nicole Fama\* (Biology)

Poster 52 *Role of Hox Gene "Deformed" in *Euwallacea validus* Mycangia Development*  
**Elliot Guerra-Blackmer**,\* Ellie Spahr and Teiya Kijimoto (Biology)

Poster 53 *Genetic Diversity in *Rickettsia buchneri* from WV *Ixodes scapularis* Ticks Revealed Using Digital PCR*  
**Rachael Hagen**,\* Victoria I. Verhoeve and Timothy Driscoll (Biology)

Poster 54 *Studying the Metabolic Crosstalk in the Terpenoid Biosynthesis Network of Plants*  
**Erin Hartzell**,\* Fiona Galley\* and Michael Gutensohn (Biology)

Poster 55 *Phylogenetic Relationships and Growth Form Evolution in the Central American Palm Genus*  
**Loren King**\* and Craig Barrett (Biology)

Poster 56 *Mitochondrial DNA Evolution of *Corallorhiza**  
**Ali Ranjbaran**,\* Nicole Fama\* and Craig Barrett (Biology)

Poster 57 *The Effects of Acid Rain on Root Colonization by beneficial fung*  
**Sina Samadi**,\* Joseph Carrara and Edward Brzostek (Biology)

Poster 58 *Examining visual acuity and retinal ganglion cell axon development in *gsx1* mutant zebrafish*  
**Rebekah Shephard**,\* Regina L Patrick, Qing Bai, Enhua Shao, Edward A Burton and Sadie A Bergeron  
 (Developmental Neuroscience)

Poster 59 *The Fungus Among Us: The Impact of Mycorrhizal Interactions on Soil Biogeochemistry*  
**Lacey Smith**,\* Nanette Raczka and Edward Brzostek (Biology- Ecology)

Poster 60 *Effects of downregulation of cell-wall modifying genes on bud set regulation in *P. trichocarpa**  
**Luke J. Stover**,\* Chanaka Roshan Abeyratne and Stephen DiFazio (Biology)

Poster 61 *The significance of *Sodalis pheA* towards the metabolic integration of tsetse symbiosis*  
**Hunter White**\* and Rita Rio (Biology)

Poster 62 *Computational Energetic Characterization of Interactions between Cell Membranes and pH (low) Insertion Peptide (pHLIP)*  
**Austin R. Clark**,\* Blake Mertz, Zachary Bonham,\* Jaycie Saseen,\* Chittrak Gupta, and Thomas Meadows\*  
 (Chemistry)

Poster 63 *Synthesis of Novel Macrocyclic Aromatic Compounds*  
**Josef C. Heller**,\* Haresh Thakellapalli and Kung Wang (Chemistry)

Poster 64 *Extension of luminescent group IV metal complexes in photoredox catalysis*  
**Dylan Leary**,\* Yu Zhang and Carsten Milsmann (Chemistry)

Poster 65 *Pyrolytic Products of Drugs of Abuse*  
**Olivia Miranda**,\* Stephen Raso and Suzanne Bell (Chemistry)

Poster 66 *A Microscale General Chemistry Lab in the Classroom: Inexpensive and Safe Personalized Learning*  
**Lindsay Veltri**,\* Tyler Davis, Cassandra Crihfield and Lisa Holland (Chemistry)

Poster 67 *Estimation of shooting distance via 2D-elemental mapping by Laser Induced Breakdown Spectroscopy (LIBS)*  
**Mandy Ho**,\* Katrina Rupert\* and Tatiana Trejos (Forensic Science)

Poster 68 *Effect of Post- Shooting Activity on Distance Determination by Colorimetric Tests*  
**Reem Karimi**,\* Melinda Hills\*, Rebecca Walls\*, Jordan Mink\*, Robert O'Brien and Tatiana Trejos (Forensic & Investigative Sciences)

Poster 69 *Exploring tree growth during the Anthropocene: the Fernow Experimental Forest as a case study*  
**Kristin Lantz**,\* Justin M. Mathias and Richard B. Thomas (Ecology)

Poster 70 *Personality mediates the association between Childhood Misfortune and Self-rated Physical Health*  
**Jordan L. Harvey**,\* Nicole M. Silva and Nicholas A. Turiano (Psychology)



Poster 71 *Parent-Child Interaction Therapy*

**Nila Manivannan\***, Jana El-Khatib\*, Karissa Bjorkgren\*, Allison Thompson\*, April Highlander\*, Lauren Quetsch, Corey Lieneman and Cheryl McNeil (Psychology)

Poster 72 *Shaping Cooperation in Pigeons*

**Amanda Ackerman\*** and Kennon Lattal (Psychology)

Poster 73 *Ew, Girls are Gross: Exploring the Relation between Disgust Sensitivity and Sexism*

**Shelly Boggs,\*** Natalie J. Shook and Cameron G. Ford\* (Psychology)

Poster 74 *Summer Research Experiences: A Predictor of Science Identity and Science Career Intent*

**Krysta Masters,\*** Patricia Hopkins,\* Paul R. Hernandez and Natalie J. Shook. (Psychology)

Poster 75 *Association Between Childhood Sexual Abuse and Midlife Depression*

**Paige Patterson\*** and Nicholas Turiano (Psychology)

Poster 76 *LGBT Prejudice Reduction through Contact: Differences based on Source of Contact*

**Jeanette Pool,\*** Holly Fitzgerald and Natalie J. Shook (Psychology)

Poster 77 *Undergraduate Research in West Virginia University's Psychology Department*

**Maggie Ruckle,\*** April Highlander, Emma Vesheco, Cassandra Drain, Lauren Quetsch, Corey Lieneman and Cheryl B. McNeil (Psychology)

Poster 78 *Personality Traits Predict Life Satisfaction Through Coping Behaviors*

**Rebecca Stegmann\*** and Nicholas A. Turiano (Psychology)

Poster 79 *Consumer Decisions at Midlife: 50 is not the new 30*

**Jackson Steinbrecher,\*** Abigail M Nehr Korn and Julie Hicks Patrick (Psychology)

Poster 80 *The Role of Future-Mindedness on Adolescent Environmentalism*

**Shannon Underwood,\*** Lindsey Bradley,\* Rebecca Olson and Aaron Metzger (Psychology)

Poster 81 *A Study on Alternative Sustainable Development Strategies for Mined Lands After Reclamation*

**Morgan Southall,\*** and J. Chris Haddox (Sustainable Design)

Poster 82 *The Effect of the Olympics on Rio de Janeiro*

**Emily Dillon,\*** Carrie Digman,\* Matthew Smith\* (Business)

Poster 83 *Discovering the Best Consumer Complaint Strategies to Gain Compliance from Financial Institutions*

**Natalie Marquart,\*** M. Paula Fitzgerald and Farnoush Reshadi (Business)

Poster 84 *The Role of Affectionate Communication During Childhood on Adult Romantic Relationships*

**Cassidy Bayes,\*** Taylor Gadd and Annabelle Hollen (Communications/Journalism)

Poster 85 *College Roommate's Use of Forgiveness Strategies with Relational Quality and Satisfaction*

**Vivian Langford\*** and Michelle Sieminski (Communication Studies)

Poster 86 *Peer Feedback among High-Ability Versus Low-Ability Reviewers*

**Nathan Altman**,\* Aubree Kiser,\* Erica Tracewell,\* Zachary Carowick, Megan Mikesell and Melissa Patchan (Education)

Poster 87 *How Peer Reviewer Ability Influences Praise and Critical Feedback?*

**Joseph McNeill**,\* Bernadine Kwan,\* Hannah Westley,\* Zachary Carowick, Megan Mikesell and Melissa Patchan (Education)

Poster 88 *Comparing the Number of Peer Feedback Comments Between Subsequent Papers*

**Audrey Weiss**,\* Courtney Wild,\* Zachary Carowick, Megan Mikesell and Melissa Patchan (Education)

Poster 89 *La Negra Tiene Tumbao: Multimodal Resistance Strategies of Afro-Latinxs and Other Queer Constructions*

**Kassandra Colón Cisneros**\* (Gender Studies- History, Latin American Studies)

Poster 90 *Perceptual Training in Speech Motor Control: What is learned?*

**Melissa Bero**,\* Jackie Smith and Kimberly Meigh (Communication Sciences and Disorders)

Poster 91 *Humor Orientation and Relational Maintenance Behaviors in College Students' Romantic Relationships*

**Katherine Burgess**,\* Erika Hamlin\* and Jacob Long (Communication Studies)

Poster 92 *Analyzing Written Descriptions to Measure Learning from Games*

**Emily B. Louk**,\* Joe A. Wasserman and Nicholas David Bowman (Communication Studies)

Poster 93 *"Exitability" and Institutional Quality: Evidence from the United States*

**Jennifer Mangano**\* and Joshua Hall (Economics)

Poster 94 *Types of Supportive Communication: How College Students Cope with Test Anxiety*

Andre Davis, **Brenna Orr**,\* Taja White (Communication Studies)

Poster 95 *Relational Attitude Self-Disclosures in Romantic Relationships after Parental Divorce*

Alexandra Vaughn,\* Janelle Vickers,\* **Kaitlyn Whyte**\* and Lauren Opatick\* (Communication Studies)

Poster 96 *Perceptions of Force in American Policing*

**Alec Corapinski**\* and James Nolan (Sociology)

Poster 97 *Paintings of People in Places; a Renaissance Update*

**Patrick Bayly**\* (Creative Arts)

Poster 98 *Law and Order's Olivia Benson through a Foucauldian Lens*

**Elana Zambori**\* (Gender Studies)

Poster 99 *Economic Warfare to Humanitarian Relief: Great Britain during the Napoleonic Era*

**Lauren Griffen**\* and Katherine Aaslestad (History)

Poster 100 *History of Jack Roberts Park Stone Wall*

**Sarah Hanna**\* and Jenny Boulware (History)

Poster 101 *Saye No More*

**Morgan McMinn\*** and Kate Staples (History)

Poster 102 *The Holocaust in American Culture: 1940s-1960s*

**Anna Schles\*** (History)

Poster 103 *An Analysis of Mental Illness in Early 20th Century Mexico*

**McKenna Williamson\*** (History)

Poster 104 *A Stilted Shift: The Southern Vowel Shift in Midland Appalachia*

**Krislin Nuzum,\*** Janelle Vickers,\* Olivia Grunau\* and Kirk Hazen (Linguistics)

Abstracts

Poster 1

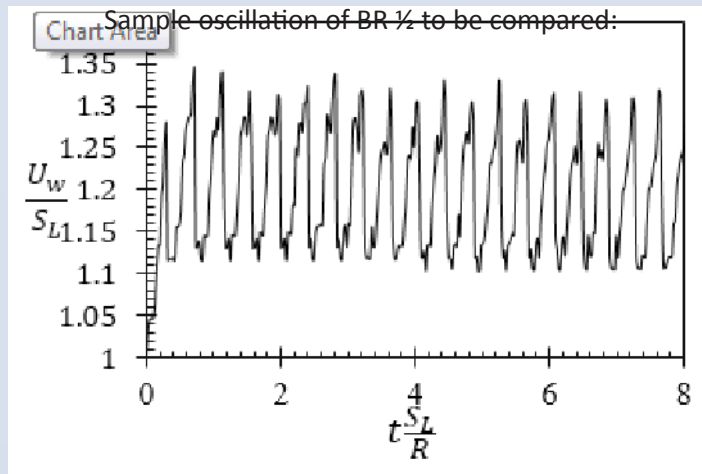
**Computational Simulations of Premixed Flame Oscillations in Obstructed Micro-Pipes**

***Amanda Cathreno***,\* Abdulafeez Adebiyi and V'yacheslav Akkerman

Field: Engineering (General Engineering)

Student's Major: Mechanical and Aerospace Engineering

Prior research indicated ultrafast acceleration, with potential transition to detonation, of premixed flames propagating in semi-open obstructed pipes (a pipe filled with a combustible premixture is open at one end; ignition occurs at the closed end such that a flame spreads towards the opening). However, industrial applications often times have both ends open, with ignition occurring at one of them. The latter configuration constitutes the focus of this work. Specifically, flame propagation through a comb-shaped array of obstacles in a pipe with both ends open is studied by solving two-dimensional fully-compressible hydrodynamic and combustion equations with Arrhenius chemical kinetics. The blockage ratios  $BR=1/3, 1/2, 2/3$  (with respect to the pipe radius) are considered, with oscillations of the burning rate observed in all cases. The oscillations are nonlinear but periodic; being steady for  $BR=2/3, 1/2$ , they slightly dampen for  $BR=1/3$ . Increase in the BR facilitates nonlinearity and promotes the oscillation period but reduces the average burning rate. These oscillations can be treated as fluctuations around a quasi-steady solution, being thereby in agreement with recent experiments and modelling of flames in open obstructed pipes that yielded steady flame propagation prior to an onset of flame acceleration. Overall, a conceptual difference between open (oscillations) and semi-open (acceleration) obstructed pipes is identified. It is presumably attributed to the fact that, in a semi-open pipe, the entire flame-generated jet flow is pushed towards a single opening, whereas with both ends open this jet flow is distributed between two flows, towards both openings, thereby weakening flame spreading.



Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: WVU-based 497-level course

Poster 2**Direct Writing of Titanium Dioxide Photoanodes for Dye Sensitized Solar Cells**

***Domenic Cipollone***,\* Lynnora Grant\*, Maria Torres and Kostas Sierros

Field: Engineering

Student's Major: Mechanical Engineering

Dye sensitized solar cells (DSSCs) are of great interest as promising alternative solar cells, due to their lower fabrication cost. This generation of solar cell eschews the need for high purity materials and high energy processing, as opposed to the conventional highly pure doped Si crystals. Furthermore, these devices are made from non-toxic, relatively abundant materials. Currently, the Flexible Electronics for Sustainable Technologies laboratory is working towards developing efficient and industrially DSSCs. The photoanode of the cell, commonly made of TiO<sub>2</sub>, is a pivotal component of the system, being the electron transport material and template for the active dye molecules. This research focuses on the development of a porous, yet continuous TiO<sub>2</sub> layer through direct writing of TiO<sub>2</sub> solution based inks onto glass and polymer substrates. The methods to characterize the inks include viscosity and contact angle measurements, and the study of the printing parameters such as speed, pressure, and distance to substrate. The proposed additive manufacturing method is found to be highly dependent on the ink's viscosity. The viscosity is tailored through varying the ratio of crystalline TiO<sub>2</sub> to Ti-organic-precursor. Additionally, the printing can be further aided by the inclusion of various polymers into the formulations, which help resolve clogging issues and improve printing fidelity. Ultimately, electrical characterization, including I-V measurement and electrical impedance spectroscopy, of the solar cells fabricated using the TiO<sub>2</sub> inks is performed.

Funding: State-WV Space Grant Consortium

Program/mechanism supporting research/creative efforts: a WVU 497-level course



Poster 3**Improving Solder Joints Formed in a Microgravity Environment**

***Matt Eberspeaker***,\* Robert Wilson,\* Raymond Nevling,\* Timothy Bear,\* Reiker Bowles,\* Anthony Fucello,\* Magdalena Krasny,\* Joel Lindsay,\* William D. Moon IV,\* Mitch Notarnicola,\* Hannah Bartlett,\* Aaron Dunkle and John Kuhlman

Field: Engineering

Student's Major: Mechanical Engineering and Material Science/Mechanical and Aerospace Engineering

The capability to solder joints in a microgravity environment would greatly enhance constraints currently limiting space operations. One main problem with soldering in microgravity is the formation of small vapor bubbles within the solder joint during solidification. This stems from the heating of the antioxidant flux inside the solder. As the solder is heated, the flux vapors would normally escape through the solder surface due to buoyancy forces stemming from Earth's gravity. However, in a microgravity environment this does not occur and a different method must be used. One way to accomplish this is to disperse microscopic iron particles uniformly throughout a solder paste matrix. This makes the paste magnetic, and if the soldering is done in a strong local magnetic field, the undesired vapors should be driven out of the molten solder. The MRT Solder Development Team members are continuously researching new solder paste compositions that will be best applicable for microgravity use. Several different solder joints have been examined for inconsistencies such as vapor bubble formation and clumping of iron particles using electron microscopy. A reflow oven and an AC induction heater are currently being constructed for microgravity soldering applications by the MRT Payload Design Team. To date, various solder pastes containing different percentages of iron particles have been melted at various temperatures and analyzed. The WVU Microgravity Research Team will continue to work towards finding the optimal solder paste combination and melting application to then test on a microgravity flight in the fall semester of 2017.

Funding: Federal-NASA

Program/mechanism supporting research/creative efforts: WVU MAE Department Technical Elective/NASA

Poster 4**Analysis of 3D Printed Titanium Rocket Nozzle**

**Timothy Fritz**,\* Aaron Dunkle, Wade Huebsch and Jay Wilhelm

Field: Engineering

Student's Major: Mechanical Engineering

In today's current market, there is an increased push towards delivering a wide variety of goods ranging from commercial, government/military, and scientific exploration efforts outside of earth's atmosphere into orbit or further. The retirement of NASA's space shuttle fleet, once the primary source of delivery for goods designated for space, and the ever increasing demand has left a gap in the delivery of space goods. New opportunities for private companies and other space agencies allow the utilization of sounding rockets for delivery and research. One company that is capable of such delivery, Orbital ATK, uses in their launch configuration Solid Rocket Boosters. SRBs give the launch vehicles an added thrust on top of that provided by the main liquid engines that are commonly used. SRB systems are much less complicated in terms of operation and have a lower production cost compared to that of a liquid propulsion system. The component that is the focus of this analysis is the SRB's nozzle, which is responsible for channeling the thrust produced by the motor. As a result of interaction with the combustion flow, the nozzle is subjected to intense heating. An investigation into nozzles that could withstand the conditions produced by a solid rocket motor firing and maintain acceptable performance was explored using a graphite and 3D printed titanium nozzle. Also of importance was focus on the precision of manufacturing methods, the survive-ability of the parts during operation, and the thrust and pressure profiles of different nozzle types that were experimentally explored.

Funding: Federal-NASA WV Space Grant Consortium

Program/mechanism supporting research/creative efforts: Voluntary

Poster 5**Titanium Dioxide Foam for Direct Writing Thin Structures*****Lynnora Grant***,\* Domenic Cipollone,\* Maria Torres and Kostas Sierros

Field: Engineering

Student's Major: Mechanical Engineering

Nanoscale titanium dioxide (TiO<sub>2</sub>) exhibits properties that make it a promising candidate for a plethora of applications. Nano scale TiO<sub>2</sub> has been used in water and air purification systems, sunscreen formulations, and solar cell devices. TiO<sub>2</sub> is a semiconductor with photocatalytic properties. Grätzel utilized TiO<sub>2</sub> as the electron transport layer in dye-sensitized solar cells (DSSC). DSSCs require low cost manufacturing procedures as opposed to Si-based photovoltaics which require a large energy input to manufacture. DSSCs are often fabricated using traditional printing methods such as ink-jet printing. However, these methods have limitations. Specifically, ink-jet printing is limited to low viscosity inks, and the deposition method may result in lines that have curved sides. For this reason, We are currently working to improve the manufacturability of DSSCs using contemporary direct writing methods. During this study, a TiO<sub>2</sub> foam ink was developed, characterized, and preliminary prints were made using a nozzle based robotic deposition system. Key Words: Direct Writing, Titanium Dioxide, Nanomaterials, Dye-Sensitized Solar Cells

Funding: Federal-McNair Scholars Program, NSF

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 6**Engineering Design for Mobile Brain Imaging Helmet – AM-PET**

**Matthew McHugh,\*** Garret Carden,\* Samantha Melroy, Thorsten Wuest and Julie Brefczynski-Lewis

Field: Engineering

Student's Major: Mechanical Engineering

A portable PET scanner would allow researchers the ability to view previously unscanned activity of the brain while the patient is actively moving or using a Virtual Reality (VR) set; this is unlike the normal PET scanner where a patient must remain still for several minutes. AM-PET (ambulatory microdose positron emission tomography) , a portable PET scanner, is a big step forward to better understand mental illness and diseases such as drug abuse, Alzheimer's, and Parkinson's disease. This novel system allows for only a small amount of radiation and thus the patient can have additional scans a year to see progression of a diagnosis. The current AM-PET helmet design consists of multiple photo detector modules that are in close proximity around a patient's head; each module weighs 200 grams, making a 10 kg helmet. Due to the significant weight of the helmet, a mechanical design was constructed to alleviate any unnecessary pressure to the patient. Many challenges are present including the ergonomics of the helmet to fit securely to the patient's head, the mechanical design to allow the patient to move freely, and the helmet design to allow the use of a VR set. Currently the Engineering AM-PET team is working on the helmet design to accommodate all the modules as well as the ergonomics of the helmet for comfort and safety of the average person's head. With advancements to the prototype, the portable PET scanner will assist neuroscientist have a better understanding of mental illness and diseases.

Funding: Federal-National Institutes of Health

Program/mechanism supporting research/creative efforts: undergrad research

Poster 7**Modeling and Optimization of the Sabatier Reactor for Fuel Production on Space Missions***Eilish Miller*,\* Brent Bishop and Fernando Lima

Field: Engineering

Student's Major: Chemical Engineering

The specific aims of this research project are to develop and optimize a simulation of a proposed Sabatier reactor that could be sent to Mars as part of a chemical plant to produce water, oxygen, and fuel. NASA has interest in the Sabatier reaction because of the need for fuel on low orbit and long-term manned space missions. Currently, there is no way of generating fuel on such missions, thus large amounts must be brought into the space crafts which is very costly and heavy. To fix this problem, carbon dioxide will be absorbed from the cabin air and the Martian atmosphere, and reacted with hydrogen to produce water and fuel. The Sabatier reactor will utilize state of the art Microlith technology because of the extremely high conversion of carbon dioxide to fuel that this technology achieves. In addition, this technology is ideal because it would decrease the typical reactor size significantly which would allow a much lower energy requirement to get the plant to Mars, saving a large sum of money. As a result of a lack of published data on Microlith reactors, a simulation of a less advanced Sabatier reactor has been modeled in MATLAB. This model will be developed into a model of a Microlith Sabatier reactor through further research and comparison of the two reactor types. Upon completion, this model can be optimized to meet the goals of NASA. This presentation will discuss how different reactor conditions and feed ratios effect fuel production.

Funding: Institutional-NASA WV Space Grant Consortium

Program/mechanism supporting research/creative efforts: Voluntary



Poster 8**Mobility System of Planetary Rovers**Yu Gu, Cameron Wilson\* and *Colin Osborn\**

Field: Engineering

Student's Major: Mechanical and Aerospace Engineering

For this research project, the team will be investigating various mobility systems that include but are not limited to tires, drive shafts, and suspension systems. The understanding the team intends to gain from our conducted research will focus on the ideal systems to optimize movement of rovers on various planetoids such as the Moon, Mars, or Saturn's moons Titan and Enceladus. In order to gain more information of these planetoids, rovers must be well adapted for their environments and must be able to overcome various unknown obstacles. This topic has been researched before however due to a mishap with the MER-A, otherwise known as Spirit, getting stuck in the Martian terrain, it is evident that the mobility systems of the rovers are not perfected. Thus, our research will address and solve these issues. Currently, there are three rovers on Mars. In 2004 Opportunity and Spirit landed on Mars to collect data, and soil samples. Opportunity has been in operation for over twelve years, while Spirit got stuck, becoming inoperable due to loss of signal connection. Just recently in 2012, the Curiosity rover touched base on Mars and is still collecting data. The goal of this research is to find ideal operating mobility systems for planetary rovers on Mars.

Funding: Federal- NASA WV Space Grant Consortium

Program/mechanism supporting research/creative efforts: WV NASA Space Grant

Poster 9**Enhancing the Properties of Polymer-Silica Composites for CO<sub>2</sub> Capture***Igor Pereira\** and Gifty Osei-Prempeh

Field: Engineering

Student's Major: Chemical Engineering

Ceramic-polymer composites can be optimized based on surface functionalization for specific applications. Incorporating nanoporous silica into polymer matrices to form polymer-silica composites provides potential access to the high surface area in porous silica and the functionality in the silica. Amberlites® are commercially available polymeric adsorbents used for various separation and catalytic processes. These materials possess fairly large pores which can be tailored for applications in areas such as CO<sub>2</sub> capture, water purification, immobilized enzyme catalysis etc. Nanoporous silica-amberlite® composites were made using TEOS impregnated Amberlite IRA- forms as seed in cetyltrimethylammonium bromide (CTAB) templating sol-gel medium. The resulting composite materials show high silica incorporation. Functional groups were incorporated into the composites to enhance their CO<sub>2</sub> adsorption capacity. The potential for these composites to be used for CO<sub>2</sub> capture will be highlighted in the presentation of their comparable surface area and pore volumes to those of nanoporous silica. However, these fairly large materials show good gas transport and easy access to the incorporated functional groups.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Other

Poster 10**Upgrading of Bio-oil from Miscanthus Pyrolysis***Jordan W. Lewis\** and Gifty Osei-Prempeh,

Field: Engineering

Student's Major: Chemical Engineering

Bio-oil derived from biomass pyrolysis shows potential as a future combustion fuel source. Miscanthus x giganteus is a hardy, nonedible plant which grows rapidly, but the presence of hard, fibrous polymers limit its potential as a biofuel source. Pyrolysis reactions break down these polymers into smaller, more combustible species without the introduction of more oxygen to the biomass. The use of catalysts may enhance bio-oil by removing unwanted oxygen content from the pyrolysate (bio-oil). A micro-pyrolyzer connected to a GCMS was used to collect data on the evolved compounds throughout the pyrolysis process. Finely dried and blended Miscanthus switchgrass was decomposed under inert conditions at different temperatures in the micro-pyrolyzer. The organics evolved during the pyrolysis were analyzed through the GCMS, and the observed data provided the necessary information for estimation of the possible chemical processes taking place during pyrolysis. The following report will detail the resulting data on Miscanthus pyrolysis over a range of temperatures, and how catalysis may improve biofuel quality by removing oxygen from the pyrolysate.

Funding: Institutional

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 11**Biosynthesis of Dihydroergot Alkaloids by Genetic Modification of the Fungus *Neosartorya fumigata****Stephanie Arnold\** and Daniel Panaccione

Field: Biochemistry

Student's Major: Biochemistry

Fungi have been used throughout the years to produce pharmaceutically important chemicals. Lysergic acid (LA) and dihydrolysergic acid (DHLLA) are structurally similar but have different activities related to cognitive function and other clinical applications. LA has been produced by genetic modification of the model fungus *Neosartorya fumigata*, but the biosynthetic pathway to DHLLA is unknown. Previous studies showed that the enzyme CloA from an LA-producing fungus oxidized the substrate agroclavine to LA. We transformed CloA from the LA-producing fungus into *N. fumigata*, but it failed to oxidize festuclavine (the dihydro form of agroclavine) to DHLLA; thus, in order to produce DHLLA a different version of CloA may be necessary. We hypothesized that CloA from *Claviceps africana*, a DHLLA-producing fungus, would oxidize festuclavine to DHLLA. *Claviceps africana* CloA was expressed in *N. fumigata* by attaching its coding sequences to an *N. fumigata*-specific promoter. HPLC and mass spectrometry analyses demonstrated that the transformed fungal colonies produced DHLLA. Substrate feeding studies indicated interesting differences in CloA specificity. Our results proved DHLLA can be produced by a bioengineering strategy.

Funding: Federal-NIH R15-GM114774

Program/mechanism supporting research/creative efforts: WVU's SURE program

Poster 12**Inhibition of glioblastoma multiforme tumors following exposure to N-(3,4-dichlorophenyl)-N-methylpropanamide (NMeDCPA)*****Kensey Bergdorf\**** and John Barnett

Field: Biology

Student's Major: Immunology and Medical Microbiology

Glioblastoma multiforme (GBM) are stage IV brain tumors for which there is no curative treatment. GBM depend upon Orai1 calcium channel signaling for migration, proliferation, and the stability of various proteins. NMeDCPA has been shown to block Orai1 channels in vitro. NMeDCPA inhibited proliferation of the U251MG glioblastoma cell line in a dose-dependent manner by 1.8% to 98.6%. Migration was also inhibited in a dose-dependent manner by 12% to 48%. Previous work from our lab indicates that Orai1 channel blockers may be effective due to hypoxia-inducible factor 1alpha (HIF-1 $\alpha$ ) inhibition. HIF-1 $\alpha$  plays a role in nearly all of GBM's most dangerous characteristics: proliferation, migration, and vascularity. In future work, immunoblotting will be used to determine whether NMeDCPA decreases HIF-1 $\alpha$  protein expression, and in vivo models will be used to determine direct tumoricidal effects and the influence on T cells and inflammation. If NMeDCPA inhibits inflammatory and T-cell responses that promote tumor progression in addition to its direct antitumor effects, it may have a future role in the treatment of GBM.

Funding: Institutional-WVU STEM SURE

Program/mechanism supporting research/creative efforts: WVU's SURE program

Poster 13**Interactions Between Circulating MicroRNA Expression and Hormonal Control of Reproductive Function in Aging Rats**

**Jared Clapper,\*** Elizabeth B. Engler-Chiurazzi, Sara E. Lewis, Ryan Lamb and James W Simpkins

Field: Biology

Student's Major: Immunology and Medical Microbiology

Reproductive function is a fundamental component of the female sex. Nearly half the world's population is female and at some point in their lives, the majority of these women will face decisions regarding their reproductive health; greater understanding the fundamental mechanisms that control reproduction is of clinical importance. One mechanism that may impact reproductive function are microRNAs. Expression levels of microRNAs, small noncoding segments of the genome that regulate protein translation, can shift dramatically in response to changes in, or challenges to, an organism. Some work investigating changes in levels of microRNA expression with respect to reproduction has been conducted yet, the relationship between circulating microRNAs and reproductive function has not been explored. Here, we determined serum levels of a microRNA panel (15a, 34a, 124, 145, 146a 210, let 7a, let 7 b, and let 7f) among intact female F344 rats aged 6, 12, 18, or 24 months. To relate microRNA changes to reproductive capacity, we determined 1) estrous stage by quantifying vaginal cytology and 2) circulating levels of the sex hormone, progesterone. Beginning at 12 months of age (corresponding to pre/peri-estropause), we noted age-related reductions in serum microRNAs 15a, 34a, 145, 210, and let 7f. Follow-up investigations methodically manipulated reproductive status (via surgical removal of the ovaries) to compare levels of circulating microRNAs in estrogen-deplete, ovariectomized rats to those of intact cycling controls. Taken together, findings from these studies may identify novel targets for the modulation of normal reproductive function as well as for the treatment of reproductive dysfunction.

Funding: Federal-National Institutes of Health

Program/mechanism supporting research/creative efforts: Voluntary



Poster 14**High Fructose Corn Syrup-55 Promotes Triglyceride Accumulation and Alters Fat Metabolism in the Liver**

***Sundus S. Lateef***,\* Kaitlin Mock, Vagner A. Benedito and Janet C. Tou

Field: Biology

Student's Major: Chemistry and Biology

High fructose intake promotes metabolic dysfunction, particularly de novo lipogenesis (DNL), a condition in which increased lipid (fat) synthesis is not compensated by increased lipid breakdown. DNL promotes non-alcoholic fatty liver disease (NAFLD). NAFLD often progresses to cirrhosis and liver failure and affects more than 28 million adults in the United States. High fructose corn syrup-55 has replaced sucrose (table sugar) as a caloric sweetener in various processed foods. This study investigated whether the slightly higher fructose content in high fructose corn syrup-55 (HFCS-55; 55% free fructose) is more lipogenic than sucrose (50% fructose in disaccharide form). Healthy growing rats were assigned to one of four treatment groups consisting of either 1) water or water sweetened with 2) sucrose, 3) fructose or 4) HFCS-55 for 8 weeks. Caloric sweeteners were administered at a concentration of 13% weight/volume, the level typically found in sugar-sweetened beverages. There was no significant difference in caloric intake between rats drinking HFCS-55 and sucrose-sweetened beverages. Rats drinking HFCS-55 had the most extensive evidence of fatty deposits in the liver of any treatment group. Molecular genetic analysis of liver tissues showed enzymes activating DNL were higher and liver lipid output was lower in the HFCS-55 treatment group compared to the sucrose group. Blood triglyceride and low-density lipoprotein levels were higher in rats drinking HFCS-55 compared to water, but not in sucrose versus water. The study results indicate that healthy growing rats were at a greater risk of developing NAFLD due to HFCS-55 consumption compared to sucrose consumption.

Funding: Institutional-West Virginia University

Program/mechanism supporting research/creative efforts: WVU's SURE program

Poster 15**Functional redundancy of OVOL and GRHL genes in the suppression of the Epithelial-to-Mesenchymal Transition**

**Joseph A. McGuire,\*** Elizabeth Duarte, James T. Boothe, James H. Fugett and Alexey V. Ivanov

Field: Cancer Cell Biology

Student's Major: Biology

About 90% of cancers are of an epithelial origin, and metastasis is the main cause of cancer related deaths. OVOL and GRHL family transcription factors are expressed in epithelial tissues and regulate the epithelial-to-mesenchymal transition (EMT), which is a known process that epithelial cells utilize to metastasize in cancer. We have previously shown that overexpression of individual OVOL or GRHL genes in mesenchymal cells inhibits EMT by repressing a major EMT inducer ZEB1. However, the exact functions and hierarchy of these genes in the maintenance of cell epithelial state are not well understood. To address this, we used the CRISPR/Cas9 system to generate knockouts of OVOL and GRHL family members in epithelial MCF7 breast cancer cells. We found that knocking out individual OVOL or GRHL genes, or double OVOL1&2 and GRHL1&2, is not sufficient to induce an EMT. We have also found that GRHLs regulate OVOL genes, suggesting that OVOLs are downstream of GRHLs. These results suggest that GRHLs and OVOLs play a redundant role in the maintenance of cell epithelial state. We are currently generating sequential (triple/quadruple) knockouts that will allow us to determine if deletion of OVOL1&2 plus GRHL1&2 will be sufficient to reactivate ZEB1 and induce EMT.

Funding: Private-Susan G. Komen Foundation

Program/mechanism supporting research/creative efforts: Biology 486 capstone

Poster 16**Comparative investigation of a novel chemotherapy for metastatic brain cancer*****Rachel Tallman***,\* Neal Shah and Paul Lockman

Field: Biology

Student's Major: Biology

Breast cancer is the second most common cause of brain metastases. Brain metastases are among the most difficult to treat because many chemotherapies cannot penetrate the blood-brain barrier (BBB), which acts as a selective filter. Consequently, there has been a push for medications that can cross the BBB and infiltrate brain tumors. In this study, a new chemotherapy called NKTR-102 was compared to conventional treatments for breast metastases to the brain, including gemcitabine, vinorelbine, docetaxel, and eribulin. Female athymic Nu/Nu mice were injected with either 4T1- or MDA-MB-231-BrLuc breast cancer cells and administered one of the therapies upon brain tumor formation, excluding the control group. Treatments were evaluated based on survival and luminescent imaging. Gemcitabine had most significant tumor burden restriction and survival for groups injected with 4T1-BrLuc cells ( $p < 0.0001$ ), while NKTR-102 was most effective in treating metastases of 231-BrLuc cells ( $p < 0.0001$ ). This suggests that treatments may have differential effects based on the genetic makeup of the cells of the tumor, highlighting the importance of personalized medication.

Funding: Private-Nektar Therapeutics

Program/mechanism supporting research/creative efforts: WVU's SURE program

Poster 17**Influence of E-Cigarettes on Vascular Function**

**Stuart A. Clayton,\*** Evan DeVallance, Kayla W. Branyan, Christopher Pitzer, Matthew Breit, Hannah Hoskinson, Brett H. Erdreich, Powsiri Klinkhachorn, Paul D. Chantler and Mark Olfert

Field: Medicine

Student's Major: Exercise Physiology

**Background:** Electronic cigarettes (E-cigs) have exponentially increased in popularity and usage due to the perception that e-cigs are safe, their usefulness as a cigarette-smoking cessation tool, and the appeal of heavily marketed flavors. There is little known about the long-term effects of E-cig vapor exposure, particularly in the context of vascular dysfunction. We hypothesize that the long-term use of E-cig vapor decreased aortic function, and increase aortic stiffness. **Results:** Aortic stiffness increased ( $0.45 \pm 0.20$  m/s) in the air-exposed group, reflecting the normal aging process. However, an accelerated age-associated aortic stiffness was noted in the cigarette ( $1.28 \pm 0.27$  m/s) and E-cig ( $1.14 \pm 0.24$  m/s) groups (ANOVA,  $p < 0.05$ ). In animals exposed to filtered air, the maximal aortic relaxation achieved to methacholine was 90%, compared to 60% and 70% in the cigarette and E-cig groups, respectively ( $p < 0.05$ ). No differences were noted in sodium nitroprusside dilation between groups. **Conclusion:** Our data suggests that 8 months of E-cig significantly accelerated the age-associated increase in aortic stiffness, and significantly impaired aortic endothelial-dependent but not endothelial-independent dilation. These data show the E-cigs induce similar vascular dysfunction to cigarette smoke exposure suggesting that E-cig have similar risk to develop accelerated cardiovascular aging and disease.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Voluntary

Poster 18**Organisms Found On Endotracheal Biofilms***Christina Cox*, \* Jane Wade and Dana Gray

Field: Medical Laboratory Sciences

Student's Major: Medical Laboratory Sciences

Bacteria create biofilms that can detach and spread throughout the body. They are multispecies communities that are displaced by aerosolization or aspiration. Bacteria will ascend from the gastrointestinal tract or descend through the mouth to interact with normal flora in the body to grow and resist treatment. Diseases such as ventilator-associated pneumonia will develop and create complications that can result in septic shock, heart failure, or lung failure. Three endotracheal tubes were obtained from the Respiratory Therapy Department at Ruby Memorial Hospital. The tubes were cut into sections labeled A, B, and C, subcultured aerobically and anaerobically, and observed for growth. Each colony was identified using Matrix Assisted Laser Desorption Ionization. Sensitivities were not performed. *Streptococcus mitis/oralis*, *Staphylococcus epidermidis*, *Veillonella parvula*, *Actinomyces odontolyticus*, and *Enterococcus raffinosus* were identified. Identification of anaerobic organisms present in biofilms is important, because resistant genes have the ability to transfer to different organisms. Anaerobes present in biofilms are not always identified due to collection and transportation methods. This study identified *Veillonella parvula*, an obligate anaerobe. The endotracheal tubes are constantly constantly exposed to oxygen due to ventilation, so it is important to study how anaerobes can survive.

Program/mechanism supporting research/creative efforts: capstone course



Poster 19**Topical Antiseptic Applications Decrease Staphylococcus aureus Biofilm on Orthopaedic Metals: But is it Enough?**

**Emily P. Ernest, \*** Anthony S. Machi, Brock A. Karolcik and Matthew J. Dietz

Field: Medicine

Student's Major: Exercise Physiology

**Introduction:** Treatments for total joint arthroplasty prosthetic joint infection (PJI) often fail as biofilm or intracellular bacteria remain following treatment, leading to recurrent infections and heavy patient burdens. The purpose of this study was to evaluate the in vitro abilities of common operating room antiseptics to decrease the Staphylococcus aureus biofilm presence on orthopaedic implant materials. **Methods:** S. aureus biofilms from a clinical isolate were created on orthopaedic implant grade titanium, stainless steel and cobalt chrome discs. Biofilms were grown for 48 hours at which time discs were evaluated as controls for baseline colony forming units/centimeter squared (CFU/cm<sup>2</sup>) and compared to five minute treatments with either 10% Betadine, sodium hypochlorite (Dakin's solution), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), or chlorine dioxide. **Results:** Control discs (n=18) across all metal types had an average of 4.2 x10<sup>7</sup> CFU/cm<sup>2</sup>. All treatments had a statistically significant reduction in CFU/cm<sup>2</sup> when compared to each metal's respective control discs (p < 0.05). For all metals combined, at each time point, the most efficacious treatments were 10% Betadine and H<sub>2</sub>O<sub>2</sub>, with an average 98% and 97% reduction in CFU/cm<sup>2</sup> respectively. **Conclusions:** Our in vitro analysis of S. aureus biofilms demonstrates a statistically significant reduction in biofilm following treatment. These chemical adjuvants provide an average 2 log reduction in CFU/cm<sup>2</sup> from implant materials. However, the overall concentration of bacteria never decreased below 10<sup>5</sup> CFU/cm<sup>2</sup>, which may still lead to recurrent infection. Further development of techniques to eradicate biofilm should be investigated.

**Funding:** Institutional-Department of Orthopaedics, West Virginia University School of Medicine Program/mechanism supporting research/creative efforts: Voluntary

Poster 20**Electronic Cigarette Expectancies in Adolescents: Exploring the Relation between Smoking Status and Beliefs**

**Hayley Harman,\*** Desireé Williford, Lisa Hynes, Paul T. Enlow, Evan Turner, Pamela Murray, Christine Banvard-Fox and Christina L. Duncan

Field: Psychology

Student's Major: Biology, Psychology, and Spanish

Adolescent electronic cigarette use has become a prevalent public health concern. While the literature on adolescent use is expanding, little is known about differences between categories of adolescent users and non-users, including those using both conventional and e-cigarettes (dual users). The present study aims to analyze differences in beliefs about e-cigarette use between different groups of adolescent tobacco users. A total of 632 middle and high school students (Ages 12-19, M=15.96; 58.6% female) in Ohio, Pennsylvania, and West Virginia completed questionnaires assessing demographics, lifetime and recent tobacco use, and beliefs about e-cigarette use (Smoking Expectancies Scales for Adolescents). A one-way ANOVA explored how smoking status (non-users, conventional cigarette users, e-cigarette users, and dual users) differed on beliefs regarding negative consequences and benefits of e-cigarette use. The groups differed significantly for perceived benefits ( $F(3, 499)=16.49, p<.001$ ) and costs ( $F(3, 495)=44.60, p<.001$ ). Post-hoc comparisons using Tukey HSD indicated that perceived benefits of smoking e-cigarettes were significantly higher among dual users ( $M=3.09, SD=1.78$ ) than the other three groups (Range of  $M=1.84-3.08$ ). Moreover, e-cigarette users ( $M=2.47; SD=1.89$ ) perceived significantly more benefits than non-users ( $M=1.84; SD=1.49$ ). For perceived costs in smoking e-cigarettes, only non-users ( $M=5.63; SD=2.39$ ) significantly differed from other groups (Range of  $M=2.93-5.63$ ), with non-users perceiving greater costs. Results suggest perceived benefits and costs of e-cigarette use vary significantly as a function of tobacco use. In the context of increasing trends of e-cigarette use among adolescents, understanding relationships between youth perceptions and their tobacco use offers opportunities for targeted public health interventions.

Program/mechanism supporting research/creative efforts: capstone course

Poster 21**Condom Use Satisfaction and Embarrassment in Females Currently Receiving Treatment for Opioid Use Disorder**

***Tanisha Hendrix***,\* Jonathan Stoltman and Julie Patrick

Field: Psychology

Student's Major: Psychology

**Aims:** Opioid dependence is a growing epidemic in the United States and the epicenter of this epidemic is the state of West Virginia (CDC, 2016). Additionally, of women in treatment for opioid use disorder, the occurrence of unintended pregnancies is double the national level (40-50% vs. 86%; Heil et al., 2011). This study aims to investigate condom use attitudes for female patients with opioid use disorder to better understand one element that might be behind this phenomenon. **Methods:** Approximately 50 females were recruited from the Comprehensive Opioid Addiction Treatment clinic at Ruby Memorial hospital, and completed a short survey on their reproductive habits after their group therapy session. This survey included the UCLA Condom Attitudes Scale (Helweg-Larsen, 1994) and questions about satisfaction with previously and currently used birth control. **Results:** We expect females to report low satisfaction ratings when concerned with condom use. Additionally, females will report higher levels of embarrassment negotiating condom use. We will use frequencies to report demographic and condom attitude information. **Discussion:** The results of this study can be used to improve reproductive health services in mental health treatment clinics, especially those that target substance use disorder. Information from this study can be used to develop targeted therapy sessions focusing on sexual health so that clinics can assist patients in learning about healthy sexual practices and thereby reducing risk of unintended pregnancies.

**Funding:** Institutional-West Virginia Clinical Translational Science Institute  
Program/mechanism supporting research/creative efforts: capstone course

Poster 22**Music Therapy and Pediatric Oncology*****Patricia Smith\****

Field: Music Therapy

Student's Major: Music Therapy

Cancer is the second leading cause of death in children between the ages 1 and 14, with occurrences rising steadily ("Key Statistics", 2016). While research indicates the benefits of having experts in pediatric oncology, recent studies reveal the importance of professional collaboration and incorporation of interdisciplinary approaches to treat these patients ("What are the differences", 2016; Darsie, 2009). These treatment teams are increasingly including music therapists. Live and interactive music therapy by a professional music therapist can engage a child in ways recorded music cannot (Standley J.M., & Hanser, S.B., 1995). A board-certified music therapist (MT-BC) conducts assessments, provides individualized treatment, and seeks feedback to achieve desired outcomes (Kemper et al., 2008) for functional, non-musical goals. A cancer diagnosis can be a frightening and uncertain experience for a child and their family, so an increased sense of security, improved coping ability, and positive self-image are common goals of the music therapist to battle the effects of intense treatment and hospitalization. Music therapy's adaptability, personalization, and expressive nature contribute to its practicality in the pediatric oncology setting. Music therapy has the power to not only help manage anxiety in parents, but also improve coping ability, confidence, and identity formation in pediatric oncology patients (O'Callaghan et al., 2011; O'Callaghan et al., 2013).

Program/mechanism supporting research/creative efforts: MUSC 444 Psychology of Music

Poster 23**Auditory Damage Risk during Video Games in Two Players***Rachael Kauffman\** and Vishakha Rawool

Field: Audiology

Student's Major: Communication Sciences and Disorders

According to the National Health and Nutrition Examination Survey, between 1994 and 2006, the prevalence of hearing loss in U.S. adolescents increased from 3.5% to 5.3% (Shargorodsky et al., 2010). Some young adults are at risk for hearing loss due to excessive recreational noise exposure. Some headsets used to play games with the Xbox One video game console emit levels of approximately 100 dB SPL between 20 Hz and 20000 Hz and some players play the games continuously for approximately 5-8 hours. This study was motivated by two young men who reported the possibility of changes in their hearing following extended game-play using the Xbox One video game console while using the Turtle Beach- Recon 30X and Xbox One- Chat Headsets. We examined their auditory function prior to and after game-play. A significant asymmetry in the auditory sensitivity was apparent in the first client within the frequency range of 2000 to 4000 Hz with worse sensitivity in the left ear where he wears the gameplay headphone. In addition, Distortion Product Otoacoustic Emission (DPOAE) testing (a sensitive test of hearing) suggested inner ear dysfunction in the high frequency range in both ears. The second client experienced a decrease in DPOAEs in the right ear at 1000 Hz after game-play with the headset placed on the right side. These results suggest the possibility of risk of auditory damage in those who play the games at high volume levels over extended time-periods. Further studies are necessary to confirm these findings.

Program/mechanism supporting research/creative efforts: a WVU 497-level course



Poster 24**Inter-professional Program to Enhance Micronutrient Knowledge in Dietetics and Medical School Students*****Rachel G. Newman\**** and Megan Govindan

Field: Nutrition

Student's Major: Human Nutrition &amp; Foods

Functional nutrition, in terms of the roles of vitamins and minerals, is an increasingly popular topic in which upcoming healthcare professionals should be well-versed. Students in the nutrition major expressed a desire to enhance their vitamins and minerals education. In addition, students in medical school are expected to understand and provide sound nutrition advice as physicians, but nutrition education is often lacking. In fact, the National Institute of Health concluded in a 2010 report that nutrition education in medical schools is still inadequate. To address this deficit and to foster inter-professional education, The Vitamins & Minerals Club Program was created. The program's curriculum is divided into 8, 1-hour meetings over a 4 semester span. Each semester highlights one topic including micronutrients involved in bone health, blood health, metabolism, and fluid and electrolyte balance. Students from the two professions switch between teaching the material and attending as a learner. Students' learning is evaluated by the completion of an online quiz at the end of each semester. The Vitamins & Minerals Club is an inventive program with goals similar to the Goldring Center for Culinary Medicine. The program aims to create a stress-free environment to increase micronutrient knowledge, while solidifying an understanding of vitamin/mineral food sources by tasting and acquiring recipes. Further, the program will stimulate a relationship between future medical doctors and dietitians by enhancing interest and confidence in nutrition. The program will organize a trial-run, with the eventual goal of partnership with WVU School of Medicine's Culinary Medicine Practice Group.

Funding: West Virginia Academy of Nutrition and Dietetics

Program/mechanism supporting research/creative efforts: a WVU 497-level course-HN&amp;F 472



Poster 25**Opioid Substance Abuse Among Occupational Therapy Patients in West Virginia***Evan Pivont,\** and Randy P. McCombie

Field: Occupational Therapy

Student's Major: Occupational Therapy

Recently, the American Occupational Therapy Association in conjunction with state associations, in an effort to demonstrate support for the US Surgeon General's call to raise awareness about opioid addiction, has initiated attempts to develop response solutions to the opioid crisis at the national and state levels. Consequently, given the intensity of the opioid epidemic in West Virginia (WV) and the challenges stemming from it, including abuse, addiction, and overdose, the purpose of this study is to examine the occurrence of known or suspected opioid abuse among patients of occupational therapists (OTs) in WV, and the extent to which OTs are trained to recognize symptoms of opioid abuse and to respond to overdose situations. The participants for an initial pilot study include a random selection of 50 WV OTs whose contact information is provided by the WV Board of OT. Upon analysis of the pilot results, a more in-depth questionnaire will be designed and postal mailed to 500 licensed OTs practicing in WV. Stemming from previous research at the national level, it is anticipated that the majority of OTs will indicate they have one or more clients who they know for certain or who they strongly suspect is abusing opioid substances, along with a majority of OTs who have had a patient exhibit the symptoms of overdose, while most will likely indicate they lack sufficient training in recognition of abuse, addiction, and overdose symptoms, nor how to respond to overdose situations, emphasizing the need for targeted education for these practitioners.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 26**High Tunnels: Starting from the Ground Up*****James McClain\**** and Eugenia Pena-Yewtukhiw

Field: Agriculture

Student's Major: Environmental Protection

High-tunnel food production presents an opportunity for West Virginia urban and non-urban agricultural production. High-tunnels could provide jobs and food for people throughout the year by extending the growing season into the late fall; they are structures used to protect crops from excessive weather conditions (e.g. early winter). The objective of this study was to establish a soil sampling design to better represent soil growing conditions within a high-tunnel. Our hypothesis was that designing soil sampling taking into account crop distribution within high-tunnels will give a better representation of the overall soil fertility than conventional sampling. The result of this study will aid in planning fertilization practices to obtain sustainable food production. The research was performed at the WVU Organic Certified Farm in a 72x26ft high-tunnel. In this structure multiple crops (e.g. tomato, carrots, strawberries, peppers) were produced in 69x3ft rows. Multiple soil cores were taken in a 3x3ft grid. The soil cores were cut into 4 depths increments (0-2in, 2-4in, 4-6in, 6-8in). The soil was dried, crushed, and analyzed for pH, lime requirement, organic matter, and bioavailable nutrients (phosphorus, sodium, potassium, calcium). Our results indicate that depth and location of sampling will show vast differences in plant available nutrients. High-tunnel construction will affect soil characteristics with depth. A designed soil sampling scheme provides better and more informative data than conventional sampling because it takes into account crops location and changes in bioavailable nutrients with depths, and as a consequence will guide appropriate soil management to increase and sustain production.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 27**Recombination Lines of HII Regions*****Ryan P. Culp\**** and Loren D. Anderson

Field: Astronomy

Student's Major: Geology

Recombination Lines of HII Regions February 7, 2017 I am studying HII regions in the Milky Way. HII regions are hot dense areas of gas and dust that are the birth sites of massive stars. They are created when radiation ionizes local gas, stripping away electrons and turning the atoms into ions. I have been looking at recombination lines of carbon atoms on the borders of HII regions. Recombination lines are caused by the electrons and ions recombining into atoms. When they recombine, they emit radiation all across the electromagnetic spectrum, but I have been looking specifically at recombination lines in the radio regime. I have so far detected carbon recombination lines from about 50 new HII regions spread all across the Galaxy. These lines from carbon tell us about the nature of the radiation on the borders of HII regions. This will help shed light on how HII regions affect the Milky Way, and ultimately inform the structure of our Galaxy. This Fall, we had new data to work with, most with strong carbon lines. Dr. Anderson and I are very optimistic that this new data will shed some more light on why HII regions are crucial to the formation and evolution of galaxies. This Spring I have been going through this new data like I did during the fall semester. Student: Ryan Culp Advisor: Dr. Loren Anderson Professor of Physics and Astronomy West Virginia University

Funding: Federal-NASA's West Virginia Space Grant Consortium

Program/mechanism supporting research/creative efforts: Voluntary

Poster 28

**Rapid Realization of the Stochastic Gravitational Wave Signal due to Galactic Mergers**

*Trey McNeely\** and Sean McWilliams

Field: Astronomy  
Student's Major: Physics

Mergers of massive galaxies often result in a merger between their central supermassive black holes. These merging binaries will generate gravitational waves, all of which add up to create a stochastic gravitational-wave background in the nanohertz range. Full realization of this signal requires generation of a large population of binaries ( $N \sim 10^{11}$ ). Each of these binaries must be assigned a number of relevant parameters, including individual masses. By manipulating the distributions from which individual black holes are drawn, we demonstrate a method which allows generation of the full population in minutes rather than weeks. We also make use of the Probability Integral Transform to rapidly draw systems. We demonstrate the validity of scaling results from lower sample size and examine the limits of such scaling. This forms the basis for analysis requiring multiple realizations of the background, such as constraining the variance of the stochastic signal. We present a preliminary investigation into the cosmic variance and confirm the utility of our model for more a detailed future investigation.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 29

**Search For Fast Radio Bursts In Rotating Radio Transients Survey**

*Robert Wilson\** and Maura McLaughlin

Field: Astronomy  
Student's Major: Mechanical and Aerospace Engineering

Fast Radio Bursts (FRBs hereafter) are bright, unresolved, broadband, millisecond, flash radio signals of extragalactic origin. First discovered from archival pulsar survey data, these phenomena are rare and fleeting bursts of radio emission originating from distances expected to be far outside our own galaxy. For this study, data from a survey for sporadic pulsars called rotating radio transients (RRATs) were re-analyzed in attempt to isolate FRB signals serendipitously detected in positions of known RRATs. Data were analyzed from a large set of observations (taken from 2003-2012) collected by the Parkes Telescope. The data collected from the RRATs survey have never been searched for FRBs and were examined with state-of-the-art newly-developed search algorithms. The data set searched is especially promising for detecting recently discovered "repeating" FRBs due to the length and amount of observations taken. With fewer than 20 FRBs having been documented, the discovery of even a single unique burst is significant. The detection of new FRBs is paramount to the understanding of their origin and cause, and to their potential use as a cosmological probe of extragalactic space.

Funding: Federal-NASA WV Space Grant Consortium  
Program/mechanism supporting research/creative efforts: WVSG Affiliate Fellowship

Poster 30**Effects of Salinity on Germination of Industrial Hemp (*Cannabis sativa*)**

***Chloe Courtade***,\* Lanjun Deng and Louis McDonald

Field: Biology-Plant Sciences

Student's Major: Forest Resources Management

Soil salinization occurs naturally in arid regions but can be made worse with improper irrigation and soil management. Soil salinity is a major yield limiting factor in many parts of the world, many of which are economically depressed. Crop plants vary in their ability to withstand different levels of salinity, however, there is a need to identify new crops that can withstand higher levels of soil salinity. Industrial hemp (*Cannabis sativa*) is a hardy crop that has potential for use as food, fiber and as a biofuel. Germination rates of five industrial hemp varieties (Canda, Fedora 17, Futura 75, Felina 32, and Delores) were determined in a petri dish experiment with six concentrations of NaCl (0, 10, 20, 40, 60 and 80mM) and four replications. Each petri dish contained 25 seeds and 2.5 mL of the appropriate NaCl solution. Petri dishes were sealed with parafilm and placed in the dark. Germinated seeds were counted after four days. Electrical conductivity and pH were determined for each salt solution. There was little impact of salt concentration on the germination rate of any of the varieties, which suggests that hemp is salt tolerant. Additional experiments are underway with higher salt concentrations. These preliminary experiments suggest that industrial hemp could be an important crop for salt-affected soils.

*Keywords:* Industrial hemp, Salinization, Germination, Tolerance

Funding: Federal

Program/mechanism supporting research/creative efforts: WVU Work Study

Poster 31**Wide Band Artificial Pulsar Dispersive Transmission Line Project**

**Jakob DeLong**,\* Stephen Melsom,\* Ashley Mullins,\* Lucas Runyan,\* Austin Schrauder,\* Natalia Schmid, Luke Hawkins and Vereese VonTonder

Field: Engineering- Radio Astronomy  
Student's Major: Electrical Engineering

The goal of this project is to design and simulate a dispersive transmission line with which to test pulsar detection equipment. Pulsars are neutron stars that emit high-energy radio pulses as they spin on a frequency range typically from 100-1000MHz, and these pulses will become “dispersed” as they pass through the interstellar space between the pulsar and earth—meaning that the high frequency components of the pulse arrive at earth before the low frequency components. This line would be used along with an artificial pulsar signal generator developed by a previous WVU senior design group to allow for easy, accurate, and repeatable on-demand testing of pulsar detection equipment without having to actually use a radio telescope to observe a real pulsar. This saves time and money on the part of astronomy facilities, and allows for much more repeatability and accuracy in test measurements. To date, no system is known to us that produces the particular dispersive behavior being modeled, and most RF design projects either completely ignore the effects of dispersion or seek to eliminate or reduce them as much as possible rather than trying to tune the dispersive properties to match a particular delay profile. A loaded line phase shifter using coplanar waveguide sections loaded with diodes in reverse bias and a substrate integrated waveguide (effectively a miniaturized rectangular waveguide) are currently under test for their initially desirable dispersive profiles.

Program/mechanism supporting research/creative efforts: capstone course



Poster 32**Understanding Change in Tree Ring Growth Over Time Without Using Methods of Detrending***Emily Bushman\** and Amy Hessler

Field: Environmental Studies

Student's Major: Geology

Long records of past climate can help us place current changes in context. Long-lived trees from semi-arid locations can provide millennium long, annually dated records of past moisture availability, but it is unclear how well these records preserve low frequency information. Most tree ring analysis uses a method called detrending, which statistically smooths out the different growth patterns of individual trees to better understand the big picture of tree behavior. In turn, this may eliminate low frequency climate signals (<100 year frequency). In this study, we measured the tree rings in cross sections of fallen Siberian pines from the Khorgo Lava and Uurgat regions of Mongolia and analyzed tree ring growth by averaging, without detrending. We aim to see if Khorgo Lava and Uurgat pines have had variable growth rates throughout at the centennial scale, dating back beyond 700 BCE. The results are still inconclusive, but they can potentially add to dendrochronology by presenting a whole new method of tree analysis.

Funding: State-West Virginia University SURE

Program/mechanism supporting research/creative efforts: WVU's SURE program

Poster 33**Nanocellulose Modified Adhesives to improve the Bond Strength of Plywood***Royce Durgin\** and Gloria Oporto

Field: Wood Science and Technologies

Student's Major: Wood Science and Technologies

The objective of this research is to perform preliminary tests concerning the incorporation of nanocellulose as a filler in adhesives commonly used in wood-based composites. By experimenting with various concentrations of nanocellulose in phenolformaldehyde and polyvinyl acetate adhesives, this study will evaluate the effect of adding nanocellulose on the final bond strength of the modified adhesives in plywood. This study will be performed during the spring semester 2017 as a research project for my WDSC 465-Wood Composites class, and the experimental design will consider two types of adhesives, and three concentrations of nanocellulose. The preparation of the adhesives and fabrication of plywood will be carried out according to work of instructions previously defined by Dr. Oporto (instructor of WDSC 465). Plywood composites will be produced with a hydraulic hot press using 1/8th inch, rotary-peeled yellow-poplar veneer. Test specimens will be prepared and tested as described by ASTM standard D 3500 for tensile specimens and ASTM standard D 906 for shear specimens. Moisture content will be determined by ASTM D 4442 and accelerated aging cycle (boiling test) evaluated by PS 1-07. To ensure consistent test results, specimens will be cut using a Shopbot CNC router, and a minimum of three specimens will be tested for each experimental condition. Additionally, the mechanical properties of each condition will be predicted using Dr. Barbero's Computer Aided Design Environment for Composites (CADEC) 14.1.6245.33651. The findings of this research project will be summarized in a PowerPoint presentation and a poster at the end of the semester.

Funding: Federal-USDA

Program/mechanism supporting research/creative efforts: WDSC 465 - Wood-based Composite Materials

Poster 34**Identifying the Antimicrobial Efficacy of Nanosilver in the Treatment of Intracellular *Staphylococcus aureus***

**Krystal A. Hughes,\*** Jason Kang, Jabeen Noore and Bingyun Li

Field: Nanotechnology

Student's Major: Pre-Pharmacy

With antibiotic resistances increasing at an alarming rate, it is imperative that alternative treatments are discovered to treat microbial infections. *Staphylococcus aureus* (*S. aureus*), a contagious bacterium, is the most common nosocomial infection. Epidemiologically, 45% of the population are carriers. Silver (Ag) has been known for centuries for its antimicrobial properties. With technological advancements and the ability to understand appropriate mechanistic approaches, nanoparticles are able to be used in specific cellular applications. Nanosilver, an established broad-spectrum antimicrobial, has shown to be an effective treatment for extracellular bacteria; however, there have been no reports investigating effectiveness in eradicating intracellular bacteria. Recently, it has been shown that *S. aureus* is an extracellular bacterium capable of surviving intracellularly. Intracellular bacteria are particularly difficult to treat, due to their host's defenses and the necessity of maintaining viability of host cells during treatment. This study will identify the efficacy of nanosilver treatments for intracellular *Staphylococcus aureus*, at different concentrations and with varying sizes of nanosilver. Human osteoblasts were co-cultured with a clinical strain of *Staphylococcus aureus* obtained from a patient at Ruby Memorial Hospital. Thus far, it has been revealed that nanosilver displays dose-dependent effects on bacterial killing percentage, up to concentrations of 40 µg/ml. This dose resulted in 80% killing of intracellular *S. aureus*, and the osteoblasts remained above 90% viability. These results were achieved within 2 hours of treatment, and maintained for 16 hours. This study will continue to examine the efficacy of nanosilver at nanomolar concentrations, while also using various sized particles.

Funding: Federal-NIH Grant P20GM103434

Program/mechanism supporting research/creative efforts: West Virginia IDeA Network for Biomedical Research Excellence

Poster 35**Petrography and Geochemistry of Megacrystic K-Feldspars from a Granitoid Intrusion, Northwestern Nevada***Holly Pettus\** and Kenneth Brown

Field: Geology

Student's Major: Geology

Potassium feldspar (K-feldspar) is a common rock-forming mineral found in igneous intrusions world-wide. While most igneous intrusions contain K-feldspar (<1cm), relatively few intrusions have exceptionally large crystals (>4cm - megacrystic). These megacrystic K-feldspar crystals are of interest because of their size relative to when they are supposed to crystallize from a cooling magma. By studying the petrography and geochemistry of these K-feldspars, we hope to gain a better understanding of the origin and timing of these enigmatic crystals. Using a standard petrographic microscope, I have examined the petrography of a suite of megacrystic K-feldspars from an igneous intrusion in northwestern Nevada. Preliminary observations reveal that all of the crystals are euhedral in shape. Internally, the K-feldspars exhibit complex zonation boundaries, sectoral zoning, and abundant inclusions. The inclusions within the megacrysts are preferentially oriented with their long axis parallel to zonation boundaries. Geochemical analyses obtained by -XRF reveals that these zonation boundaries are correlated with high Ba content and other trace elements. These observations can help us better understand the chemistry of the system while these crystals were forming, and perhaps why the K-feldspars grew so large. In addition to petrography, ongoing work with these samples will include scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and electron probe micro-analyses (EMPA). These techniques will help us map the elemental distribution within the crystal, giving me a better understanding of what was happening during the formation of the K-feldspars.

Funding: Private-Kenneth Brown

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 36**Study of the Transfer and Persistence of Glass in a Mock Kidnapping Case*****Katrina Rupert*, \* Mandy Ho\* and Tatiana Trejos**

Field: Forensic Science

Student's Major: Forensic and Investigative Science

The frequency of occurrence of background glass in the general population, as well as studies of transfer and persistence are key for the forensic comparison and interpretation of glass evidence. For instance, a question that may arise in cases, such as hit and runs and kidnappings, is the location of the individual during the breaking event. This mock case was designed to evaluate how glass shards are transferred and to what extent they persist through numerous activities. A kidnapping scenario was devised and consists of the breaking of a driver's side car window with the victim in the driver's seat and three suspects positioned around the breaking window. Prior to the event, background glass was collected from those participating to provide a baseline control. Following the smashing of the window, the victim was bound and thrown into the trunk of the suspects' vehicle and then the suspects drove away. After the scenario concluded, evidence was collected from the victim, the suspects, the exterior of the victim's car, and the interior of both suspect and victim's vehicles. The glass pieces gathered were then sorted by size into four categories and documented. As expected, the largest and most significant quantities of glass were found in closer proximity to the window both on the interior and exterior of the vehicle. As the distance from the site increased, the size and amount of shards decreased. Moreover, transfer and persistence of glass was influenced by garment construction and post-breaking activities.

Funding: Institutional-Faculty Start-Up Funds

Program/mechanism supporting research/creative efforts: a WVU 497-level course



Poster 37**Food Security and Substance Abuse of College Freshmen**

**Rachel A Wattick,\*** Makenzie L Barr; Rebecca L Hagedorn; Karla Shelnutt, Anne Mathews, Sarah E Colby, Tracey Barnett and Melissa D. Olfert

Field: Nutrition

Student's Major: Human Nutrition and Foods

Recent studies have found that over half of college students lack food security, or having a sufficient quantity of affordable, nutritious food. This research addresses the lack of understanding of the level of food security experienced by college freshmen and substance abuse by these individuals. Data was taken from at-risk college freshmen enrolled in the Fruved study, a peer-led social marketing campaign increasing healthier lifestyles among college students from eight universities across the United States. Students were assessed at baseline (Fall 2015) and items analyzed here were from a larger behavioral survey. Food security questions were scored using the USDA Adult Food Security Survey Model. Score categories are: high food security (0), marginal food security (1-2), low food security (3-5), and very low food security (6-10). Respondents (N=1661) had a mean food security score of 2.77 (SD 1.85). No students fell into the high food security category, 55.1% of respondents were marginally food secure, 34.4% had low food security, and 10.5% had very low food security. Substance abuse questions asked participants about the frequency of their use of various tobacco substances within their lifetime, the past year, and the past 30 days. When the frequency of substance use in the question increased, the students who were categorized as some level of food insecure and responded affirmatively increased. Food insecure individuals may be more likely to abuse substances habitually based on these findings. Further investigation with larger sample and diverse reach of young adults is warranted to further inform intervention programs.

Funding: Federal-National Institute of Food and Agriculture, U.S. Department of Agriculture, award number 2014-67001-21851

Program/mechanism supporting research/creative efforts: Voluntary

Poster 38**Hagstrum's Theory on Auger Emission for Metal Oxides*****Manaswi Daksha\**** and F. Julian Schulze

Field: Physics

Student's Major: Physics

The production of thin film metal oxides is extremely important in the manufacturing of highly technical devices. These films are often manufactured utilizing capacitively coupled plasmas. It is important to control plasma parameters such as the ion flux and mean ion bombardment energy to produce high quality oxides. However, these parameters are sensitive to the property of the surface. In order to model the plasma, it is important to know the sticking coefficient and secondary electron emission coefficients (SEEC) for electrons due to ion and electron impact. However, there is little experimental data on these coefficients. Here, a theoretical model for predicting the SEEC due to bombardment by low energy Nobel gas ions is introduced. Since this is at low temperatures, the theory only considers potential emission due to Auger neutralization and Auger de-excitation. Also, impurities are considered and the implementation of oxygen gas. Finally, the predictive power of the model is tested. Any deviation from experimental results is explained through fundamental physical principles.

Funding: Other-DFG (SFB/TR 87)

Program/mechanism supporting research/creative efforts: Student Assistantship at Ruhr University of Bochum

Poster 39**Discrimination of Illuminance by Sprague Dawley Rats*****Kaleigh Alkire*,\* Cory Whirtley, Forrest Toegel and Michael Perone**

Field: Psychology

Student's Major: Psychology

Depending on its brightness and the circumstances in which it is presented, white light can affect the behavior of rats in a variety of ways. The purpose of this experiment was to assess the ability of rats to discriminate different levels of the brightness of light. Individual rats were studied in an operant conditioning chamber with two lamps for general illumination, a lever for recording behavior, and a pellet dispenser for delivering food reinforcers. The rats were trained on a multiple schedule of reinforcement with two components. In one component, a variable-interval schedule arranged for lever presses to be reinforced with food on an intermittent basis. In the other component, an extinction schedule was programmed: Lever presses were never reinforced. The components were signaled by the brightness of the chamber – or, more precisely, by the illuminance of light measured near the floor of the chamber. One of the components was signaled by a relatively high level of illuminance and the other by a relatively low level of illuminance. Across conditions, we studied illuminance levels ranging from 0 lux (complete darkness) to 68 lux. If a rat discriminated the two levels, it would press the lever in the component with the variable-interval schedule of reinforcement and refrain from pressing in the component with extinction. The results to date indicate that rats can indeed discriminate relatively small differences in illuminance, but the absolute levels of illuminance also are important. \*

Program/mechanism supporting research/creative efforts: capstone course

Poster 40**Preference for Single vs. Multiple Reinforcer Presentations*****Sarah A. Brady,\**** Anthony C. Oliver and Kennon A. Lattal

Field: Psychology

Student's Major: Psychology and Criminology

Reinforcer duration is one of the most commonly used manipulations of reinforcer magnitude in experimental behavioral research (Bonem & Crossman, 1988). When reinforcers of different durations are presented, they are accompanied by the same stimuli (in the case of pigeons, identical hopper sounds and illumination). Given that reinforcers of differing durations have similar onset, it is unclear as to the effect reinforcer onset has on preference. One of the more widely used methods for assessing preference in non-human subjects is with the concurrent chains schedule. The preference of three pigeons for single vs. multiple reinforcer presentations were assessed using a concurrent chains arrangement in which one terminal link led to a reinforcer of 10 s in duration and the other resulted in five 2-s hopper presentations. In this arrangement, the measure of preference is the rate of response in the initial link, with higher response rates indicating the preferred alternative. There was no effect of multiple hopper presentations on preference as indicated by initial-link responding. Further, terminal link response rates were insensitive to the differing reinforcer presentations. Thus, reinforcer onset appears to not be an important factor in determining preference between two alternatives of similar duration.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Psychology 495

Poster 41**Effects of Race-Based Rejection Sensitivity on Stress and Depression in African Americans**Daniel McNeil, *Deja Clement*,\* Remy Black and April Highlander

Field: Psychology

Student's Major: Psychology

African Americans are vulnerable to a number of detrimental health outcomes due in part to racial discrimination in the United States, in academic, occupational, and social settings. Disadvantages associated with racial discrimination may act as chronic stressors for African Americans. Previous studies have demonstrated the connection between racial discrimination and negative mental health outcomes (e.g., depression and anxiety). Race-based rejection sensitivity has been related to depression and anxiety in past research. Using linear regression models in the present study, race-based rejection sensitivity was found to predict level of self-reported depression ( $\beta = .391$ ,  $R^2 = .153$ ,  $p = .027$ ), but not stress ( $\beta = .151$ ,  $R^2 = .023$ ,  $p > .10$ ), in 32 African American adults. The impact of race-based rejection sensitivity on level of depression is emphasized in the current results.

Keywords: African Americans, discrimination, mental health, stress, depression

Program/mechanism supporting research/creative efforts: Ronald E. McNair Scholars Program

Poster 42**The Effects of Changes in Reinforcer Magnitude on Resurgence***Matthew T Klocke*,\* Anthony C. Oliver and Kennon A. Lattal

Field: Psychology

Student's Major: Psychology

Traditionally, resurgence is defined as the recurrence of behavior following a period of non-reinforcement, in which an alternative response is trained and then subsequently extinguished. Although resurgence is typically examined in contexts in which the alternative response is extinguished, there is some preliminary evidence to suggest that resurgence will occur in the absence of extinction. The current experiment is a further examination of the conditions under which resurgence will occur by examining the effects of transitioning from delivering primary reinforcers to conditioned reinforcers. In the alternative reinforcement phase, lever pressing was maintained with the delivery of a food pellet accompanied with a light and tone. During the resurgence test, the food was no longer delivered, rather only the light and tone was delivered as a consequence. Under this new condition, resurgence was observed in three of the four rats. This indicates that changes from primary reinforcement of the alternative response to conditioned reinforcement may be sufficient enough for producing resurgence.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Voluntary



Poster 43**Discriminative Stimulus Control by Three Different Sources*****Brittany Wood***,\* Tyler Nighbor, Kennon A. Lattal and Brian Katz

Field: Psychology

Student's Major: Forensic Science

Discriminative stimulus control by three different sources of reinforcement was studied using a conditional discrimination procedure. Four adult White Carneau pigeons with a history of responding on various schedules of reinforcement were used. In the first condition, a concurrent variable-interval (VI) VI schedule was used and choice accuracy on identifying the source of reinforcement (i.e., left or right key) was measured. During the second condition, a concurrent (VI) (VI) (tandem variable-time [VT] differential-reinforcement-of-other-behavior [DRO]) schedule was used. Again, choice accuracy on identifying the source of reinforcement (i.e., left, right, or neither key) was measured. Under the tandem VT DRO schedule, a 2-s pause prior to the onset of the choice component was required. The purpose of the current experiment was to manipulate the pause requirement and measure the effects on choice accuracy. Results of the current experiment were that the overall accuracy was overall lower following the introduction of the pausing contingency as compared to the concurrent VI VI schedule. Choice accuracy on the different DRO requirements were fairly idiosyncratic across pigeons.

Funding: Institutional-Eberly College of Art and Sciences

Program/mechanism supporting research/creative efforts: WVU Psychology 495

Poster 44**Ergot Alkaloid Production in Agriculturally Important *Metarhizium* Fungi*****Caroline E .Leadmon\**** and Daniel G. Panaccione

Field: Agriculture and Biochemistry

Student's Major: Biochemistry

Ergot alkaloids are agriculturally and medically important chemicals produced by several types of fungi. Since many ergot alkaloids are lysergic acid derivatives, they have many health effects such as reduced circulation and altered neurotransmission. Ergot alkaloids have been studied intensively in several fungi but only recently have been detected in the fungal genus *Metarhizium*. Ergot alkaloids have insecticidal and insect feeding deterrent activities, allowing them to act as natural pesticides. Fungi in the genus of *Metarhizium* are also used as natural pesticides. *Metarhizium* species colonize soil and infect plant roots in a beneficial way. To better understand the production of ergot alkaloids in *Metarhizium* species, we are testing the presence and quantity of alkaloids on different media and in plant roots. We grew both *Metarhizium anisopliae* (MA) and *Metarhizium flavoviride* (MF) on corn meal agar, malt extract agar, and sucrose yeast extract agar. The presence and quantity of alkaloids varied by fungus and on different media. MF and MA both produced ergot alkaloids on the sucrose yeast extract agar, while they produced trace quantities on malt extract agar. Neither MA nor MF produced detectable alkaloids on corn meal agar. We also inoculated the roots of corn (*Zea mays*) and *Medicago truncatula* with MF and MA and will test for alkaloid presence in the roots and shoots of the plants. A long term goal of this research is to determine whether the alkaloids produced by MA and MF have agricultural or ecological impacts.

Funding: Federal-National Institutes of Health

Program/mechanism supporting research/creative efforts: Funded Research

Poster 45**Cultivation of *Haemonchus contortus* to the adult stage in vitro*****Brenton Mays*,\* Javier Garza and Scott Bowdridge**

Field: Agriculture- Parasitology

Student's Major: Animal Sciences

*Haemonchus contortus* infections result in significant financial losses to small ruminant producers due to decreases in animal production and death of the infected animal. The development of widespread anthelmintic resistance further creates a need to increase our knowledge of this parasite and its interaction with the host. Immunological studies require vast amounts of material from all parasitic life stages. Currently, culture of *H. contortus* requires incubation within the host and requires the termination of the culture animal to collect adults. There is currently no method to grow *H. contortus* to the adult stage outside of an animal. However, using a medium developed to mimic abomasal conditions, our aim is to culture *H. contortus* to the early adult stage. This would allow for complete cultivation from egg to adult in vitro and permit laboratory maintenance of *H. contortus* for extended periods of time, reducing need for terminal studies involving research sheep. This study is a work in progress, we are currently successful in culturing to the 4th larval stage.

Funding: Federal-USDA

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 46**Evaluating Parasite Resistance in Terminal Sheep Breeds*****Curtis Patton\****, Scott Bowdridge and Javier Garza

Field: Agriculture

Student's Major: Animal and Nutritional Sciences

Breeds resistant to nematode parasites often have lower growth rates and decreased carcass quality compared to parasite susceptible breeds. Using terminal sires with superior production traits and parasite resistant ewes has been shown to generate progeny with increased parasite resistance. However, the levels of resistance in progeny can vary based on the sire breed. The aim of this research was to evaluate parasite resistance in Texel sheep during both a primary and challenge *Haemonchus contortus* infection when compared to parasite-resistant and -susceptible breeds of sheep. Ten St. Croix, 10 Suffolk lambs and 20 Texel lambs were randomly assigned to naïve (n=5) or infected (n=5 for St. Croix and Suffolk n=15 for Texel) groups per breed. Priming infection of 10,000 L3 larvae were administered and infection persisted for 12 weeks before lambs were dewormed. Following 3 weeks of rest, primed lambs were challenged with 5,000 *H. contortus* L3 and infection was allowed to persist for 7 weeks. Throughout the study, infection status was determined via fecal egg counts and packed cell volume weekly. No differences were found in either FEC or PCV between breeds during primary infection. During challenge infection St. Croix FEC were lower than both Texel and Suffolk lambs (535 vs 1917 and 3492 eggs,  $p < 0.001$ ). PCV during challenge infection showed a similar trend. These data indicate that Texel sheep are more resistant to infection than Suffolk sheep and may serve as better terminal sires for generating crossbred resistant progeny.

Funding: Federal-USDA

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 47

**A Search for Fast Radio Bursts in Archival Green Bank Telescope Drift Scan Data**

***Anika H. Rowe***,\* Peter Gentile and Maura McLaughlin

Field: Astronomy

Student's Major: Chemistry

To date, there are only 17 cataloged fast radio bursts (FRBs), which are millisecond pulses of radio emission whose high dispersion measures (DM) for a given line of sight indicate that they originate from beyond the Milky Way. In this search, data from the Green Bank Telescope's 2007 drift scan survey at 350 MHz is undergoing re-processing for FRBs out to a DM of 5000 pc cm<sup>-3</sup> via single-pulse search software; the resulting plots are being inspected manually. The cause of these bursts is unknown, but by adding to the catalog of previously detected FRBs through searches like this, we may elucidate the source type, whether it is a known periodic radio source such as a pulsar or magnetar (which the newly-discovered repeating FRB 121102 may suggest), a cataclysmic event, or a new class of neutron star. If an FRB is detected in the data, it will be the first detection below 800 MHz; if FRBs are absent, we will set new limits on the properties of these sources at low frequencies.

Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: WVU's SURE program



Poster 48**Identification of Sorghum and Foxtail Millet Genotypes to Study Saline Tolerance in Cereal Grasses**

*Rachel E. Bainbridge*,\* Ashley Henderson and Jennifer S. Hawkins

Field: Biology

Student's Major: Biology & Psychology

As the global population continues to increase, the availability of arable land is decreasing. Therefore, future agricultural practices will need to take advantage of marginal lands. One common abiotic stress that can affect crop biomass and yield is increased concentrations of salt, which is often found in marginal soils. The current study aims to identify salt tolerant and sensitive genotypes of sorghum and foxtail millet to be used in future studies for differential gene expression analysis. In the work described here, 23 accessions of sorghum and 33 accessions of foxtail millet from diverse geographic locations were selected to identify tolerant and sensitive genotypes using both physiological and morphological methods. Three levels of salt treatment were used to induce stress. For each accession and saline level, 10 replicates were grown for 8 weeks, after which biomass, leaf count, percent live leaves, leaf width and length, height, tiller number, flower number, SPAD reading, and photosynthetic efficiency were measured. Statistical methods, implemented in R, were used to identify significant morphological and physiological differences between salt-treated and control groups. It was expected that sensitive lines would present with reduced aboveground and belowground biomass, tiller number, and photosynthetic efficiency. Future studies will employ selected salt sensitive and tolerant genotypes to delineate the genetic and transcriptional differences between these accessions. Differentially expressed genes among tolerant and sensitive genotypes will reveal genetic pathways of salt stress response in cereal grasses, a clade of particular agronomic importance.

Funding: Institutional-Eberly College Doctoral Research Grant to Ashley Henderson

Program/mechanism supporting research/creative efforts: Biology 386 Undergraduate Research

Poster 49**Genetic variation in Dip5, an amino acid permease, regulates glyphosate resistance in *S. cerevisiae******Audrey Biega\**** and Jennifer Gallagher

Field: Biology

Student's Major: Biology

Yeast are a commonly utilized model organism for eukaryotes because of the ease by which its genome can be manipulated and the resulting phenotypic changes studied. Anthropogenic practices can result in unintentional selective pressures in non-target organisms. The wide-spread commercial use of glyphosate, the active ingredient in the broad-spectrum herbicide, Roundup, has resulted in the appearance of glyphosate-resistant yeast in agricultural strains isolated after the commercial introduction of the herbicide. Glyphosate targets the shikimate pathway which is absent in mammals and ultimately prevents the synthesis of the aromatic amino acids. We seek to characterize and understand the mechanisms by which yeasts have developed glyphosate resistance; in this study, we are investigating Dip5. Dip5 is a transmembrane amino acid permease and becomes endocytosed when in the presence of aspartic acid (D). Characterization of Dip5 as a mediator in glyphosate up-take was accomplished through (1) testing DIP5 knockouts and (2) treating wild-type strains with D treatment. Increased resistance was shown in knockout strains and strains grown in D as compared to wildtype strains and those grown in media without D, respectively. Four single nucleotide polymorphisms in the promoter region may contribute to variation in glyphosate resistance. Resistant strains show two-fold lower DIP5 mRNA expression as compared to the sensitive strain. DIP5 promoter swaps between sensitive and resistant strains are being carried out to observe transference of resistance. Additionally, it is suspected that hypomorphy in Dip5 results in increased resistance, as the compromised protein function prevents glyphosate transport into the cell.

Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: WVU's SURE program and BIOL 386

Poster 50**Determining Hybridization and Population Distribution of two Rail Species by using Molecular Techniques**

***Jessica Bland***,\* Stephanie Coster, Lauren Schumacher and Amy Welsh

Field: Biology- Conservation Genetics

Student's Major: Biology

The identification of hybridization between species contributes to the conservation and management efforts for the populations as well as providing further insight to the population structure and distribution. This study examines a mixed population of Clapper Rail, *Rallus crepitans*, and King Rail, *R. elegans*, located in Virginia. The goal was to determine the sex ratio of males and females within the population. This was done by utilizing sex markers and the introns of the CHD gene to identify the Z and W sex chromosomes. This will allow us to examine the spatial relatedness of males and females to better understand territory behaviors. An example would be if we found a large population of closely related females residing in one location while related males were found spread throughout the area. This would indicate that the males leave the nesting territory while the females do not. In future studies, this data will also be combined with genetic variation data provided by single-nucleotide polymorphisms (SNPs) to provide insight to the hybridized breeding within the population. Along with population distribution, the viability of the hybrids for both sexes can be determined based on the numbers of surviving male and female hybrids.

Funding: State-The Virginia Department of Game and Inland Fisheries  
Program/mechanism supporting research/creative efforts: Voluntary

Poster 51**Striped Coralroot: An Investigation into the Potential Divergence of two Californian Populations**

***Anna French*, \* Craig F. Barrett and Nicole Fama\***

Field: Biology

Student's Major: Biology

Striped Coralroot (*Corallorhiza striata*) is an orchid that is prevalent across much of North America and has evolved to be parasitic on fungi for sustenance. Studying *C. striata* gives insights into the evolution of plants that have lost the ability to photosynthesize and provides an interesting perspective on how some plant species have become reliant on fungi for obtaining carbon. The objective of this study is to better understand the evolutionary history of Californian members of the *C. striata* species complex and to determine whether populations of *C. striata* located in California are separate species. Our research will utilize polymerase chain reaction (PCR), a method used to exponentially increase the number of copies of DNA isolated from a sample of interest, to screen high variation regions of the *C. striata* genome. We will also amplify and sequence the fungal DNA from which *C. striata* obtains carbon as this relationship has been shown to be highly specific. These investigations will allow for us to analyze the genetic differences between the populations and draw conclusions regarding their classifications. In addition to the implications these findings have for understanding the evolutionary history of *C. striata*, they could also have significance for the conservation and classification of hundreds of types of non-photosynthetic orchids.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Biology 386 Independent Research

Poster 52**Role of Hox Gene “Deformed” in *Euwallacea validus* Mycangia Development*****Elliot Guerra-Blackmer*,\* Ellie Spahr and Teiya Kijimoto**

Field: Biology

Student's Major: Biochemistry and Applied and Environmental Microbiology

Ambrosia beetles are a group of more than 3,200 known species. Their evolutionary success is attributed to an obligate mutualism with several species of fungi, which are the sole food source for developing ambrosia beetles. *Euwallacea validus*, native to Asia, is a growing ecological threat in North America due to its symbiosis with *Fusarium* sp., which is a wood decaying fungus. *E. validus* possesses mandibular structures, called mycangia, which are used to carry their fungal symbiont between tree hosts. To understand the evolutionary/ecological importance of the symbiosis, it is important to explore the development of mycangia. We hypothesize that HOX genes, a highly conserved superclass of developmental genes responsible for body segment development, could be partially responsible for mycangia development. In particular, the HOX gene Deformed (Dfd), which is responsible for mandible development in other insect species, may have a role in mycangia development, due to their proximity to the mandibles and Dfd's role in head structure/mandible development. Since *E. validus* is not a model organism, no known sequence for Dfd existed. We attempted to isolate and clone Dfd in *E. validus* by comparing previously published Dfd sequences from model organisms to design degenerative primers for amplification. Currently, we have successfully obtained a partial sequence of *E. validus*' Dfd gene and confirmed its high similarity to Dfd in other arthropod species. Ultimately, the function of Dfd will be studied with RNAi treatment on living and developing beetles, repressing its expression so its role in mycangia development can be investigated.

Funding: Federal

Program/mechanism supporting research/creative efforts: WVU's SURE program



Poster 53**Genetic Diversity in *Rickettsia buchneri* from WV *Ixodes scapularis* Ticks Revealed Using Digital PCR**

***Rachael Hagen*,\*** Victoria I. Verhoeve and Timothy Driscoll

Field: Biology

Student's Major: Biology

The Lyme disease tick *Ixodes scapularis* is the primary vector of several human pathogens in the United States; it also harbors at least one obligate intracellular species (*Rickettsia buchneri*) of unknown significance. *R. buchneri* is a member of the Spotted Fever Group (SFG) and is vertically inherited with high efficiency in *I. scapularis*. Its genome sequence reveals a surprisingly plastic accessory genome dominated by mobile genetic elements, suggesting significant genetic diversity. In this study, we examined the distribution of *R. buchneri* in *I. scapularis* ticks from West Virginia (WV), using a novel multiplex digital PCR assay specific to *R. buchneri*. Our results indicate that *R. buchneri* is widespread in WV *I. scapularis*, possibly reaching full population saturation. Several ticks were SFG positive but not detected by our *R. buchneri* specific assay; it is likely that *R. buchneri* in these ticks lack both specific targets. This is supported by the uncorrelated variation in target copy number ratios within individual ticks, and suggests *R. buchneri* populations within individual ticks may exhibit substantial genetic diversity.

Funding: Institutional-West Virginia University

Program/mechanism supporting research/creative efforts: Voluntary

Poster 54**Studying the Metabolic Crosstalk in the Terpenoid Biosynthesis Network of Plants***Erin Hartzell*,\* Fiona Galley\* and Michael Gutensohn

Field: Biology

Student's Major: Horticulture

Terpenoids are a large class of natural products found in all living organisms. These compounds play essential and specialized roles in organisms in processes such as energy production (photosynthesis, respiration), growth and development (hormones), structural integrity of cells (cholesterol), and communication with the environment (pigments, scent). In plants two independent metabolic pathways operate in parallel providing building blocks for different sets of terpenoid products. Although these two pathways are localized in different compartments of plant cells, the metabolites they form are routinely exchanged between them. While the multiple steps of both pathways have been studied in great detail, comparatively little is known about the metabolic crosstalk between them. In this project we use a plant line that is defective in one of the two metabolic pathways. As this pathway provides building blocks for the formation of chlorophyll, the green pigment found in leaves and stems of plants, this plant line has a pale appearance. We have now increased the production of those building blocks by the second pathway via genetic engineering of this plant line, which indeed resulted in the recovery of chlorophyll formation. Since this indicates the exchange of building blocks between the two biosynthetic pathways, we are now studying the effect of this engineering approach on the formation of multiple terpenoid products in both cellular compartments. A better understanding of this metabolic crosstalk will allow to develop plants that produce large amounts of specific terpenoid compounds widely used by humans as nutritional supplements, flavors, fragrances, biofuels and pharmaceuticals.

Funding: Other-American Society of Plant Biologists ASPB

Program/mechanism supporting research/creative efforts: ASPB SURF

Poster 55

**Phylogenetic Relationships and Growth Form Evolution in the Central American Palm Genus**

*Loren King\** and Craig Barrett

Field: Biology

Student's Major: Biology

The genus *Brahea*, known as the hesper palms is composed of 12 species in the family *Arecaceae*. Members of this genus have been important resources in drier areas of Central America, yet phylogenetic relationships among its species remain poorly understood. In the goals of this project are to resolve the phylogenetic relationships among species of *Brahea*, to characterize patterns of plastid genome evolution, and to determine the number of origins of the acaulescent (shrub-like) growth form. This study will be conducted by using PCR and Sanger sequencing of single-copy nuclear introns for samples collected from Huntington Botanical Garden in San Marino, California. The data will then be used for phylogenetic analysis and ancestral state reconstruction of growth form. Results will be compared to previous analyses based on plastid and mitochondrial data, generated via next generation sequencing. It is hypothesized that nuclear introns will show strong branch support, and that the acaulescent growth form has evolved multiple times in the genus.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Other

Poster 56

**Mitochondrial DNA Evolution of *Corallorhiza***

*Ali Ranjbaran,\** Nicole Fama\* and Craig Barrett.

Field: Biology

Student's Major: Biology

In our research we investigate the phylogenetic relationships and evolutionary dynamics of mitochondrial genomes in *Corallorhiza*, a genus of mycoheterotrophic orchids. mycoheterotrophic orchids are a type of organism that live in association with fungi and obtain all or part of their nutrient from parasitism upon fungi rather than from photosynthesis. Mitochondrial genomic data collected via short-read, Illumina sequencing will be used to assemble mitochondrial gene sets to be used in analyses of evolutionary relationships across the genus. Further, we will sequence, assemble, and annotate one complete mitochondrial genome each from representative green and non-green members of the genus, *C. trifida*, and *C. striata* respectively, using Pacific Biosciences long-read data to compare these two species with *Corallorhiza* species. Mitochondrial DNA resolves relationships in *Corallorhiza*, and shows similar patterns to those from chloroplast DNA. Comparative methods were used to test the hypothesis that non-green species have a higher mutation rate for mitochondrial DNA compared to green, photosynthetic species, due to their completely heterotrophic lifestyles.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Other

Poster 57**The Effects of Acid Rain on Root Colonization by beneficial fung***Sina Samadi*,\* Joseph Carrara and Edward Brzostek

Field: Biology

Student's Major: Biology

Historically, eastern US forests have received high inputs of nitrogen and sulfur from acid rain. Generally, trees produce more wood when they are fertilized by the nitrogen in acid rain, but belowground responses in soil are variable. Soils are an important sink for carbon dioxide, and as such, it is critical to understand how they respond to acid rain. Most tree species form beneficial relationships between their roots and either arbuscular (AM) or ectomycorrhizal (ECM) fungi. Trees invest carbon (i.e., carbohydrates) in maintaining these relationships in exchange for nutrients. ECM trees obtain nitrogen by sending carbon belowground to microbes to stimulate the production of enzymes that break down organic matter and release nitrogen. AM trees mainly take up inorganic forms of nitrogen and allocate less carbon belowground to obtain it. We hypothesized that when trees receive additional N through acid rain they would invest less carbon in mycorrhizae and other pathways to access nutrients. We sampled soils from two long-term experiments at the Fernow Experimental Forest, WV and Bear Brook Watershed, ME. We compared belowground responses in AM and ECM dominated plots between watersheds that receive additional acid rain inputs by helicopter and control watersheds. We found that acid rain reduced mycorrhizal root colonization and total fine root biomass in ECM stands to a greater extent than AM stands. Understanding belowground responses of AM and ECM stands to elevated nitrogen will provide insight into soil responses which may help build more accurate models for predicting future climate change.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Biol 386

Poster 58**Examining visual acuity and retinal ganglion cell axon development in *gsx1* mutant zebrafish*****Rebekah Shephard*,\*** Regina L Patrick, Qing Bai, Enhua Shao, Edward A Burton and Sadie A Bergeron

Field: Developmental Neuroscience

Student's Major: Biology

An organism's ability to differentiate object size and shape, or visual acuity, is imperative for daily tasks and functions. Visual acuity can be assessed by measuring the optokinetic response (OKR), saccadic eye movements that stabilize retinal images while an organism is in motion. Such processes depend on the correct formation of neural circuits that transmit visual information from the eyes to the brain. *gs homeobox 1 (gsx1)* is an important gene for early neurodevelopment that is expressed in many brain regions, including the developing optic tectum in zebrafish. However, no research has yet examined its role in the differentiation of visual neural circuits. Our preliminary data shows that zebrafish that are homozygous for a mutation in *gsx1* lack glutamate expression in the pretectum by 6 days post fertilization (dpf), indicating that this brain region is not specified properly during development. In addition, juvenile and adult *gsx1* mutants repeatedly swim into the side of their tank, suggesting that they might not see properly at all. Thus far the OKR of *gsx1* mutant larvae appears impaired compared to their wild type siblings. We hypothesize further that the retinal ganglion cell (RGC) axons that connect the eye to the pretectum do not form properly. To test this hypothesis, we will microscopically analyze RGC axon connections to the pretectum in *gsx1* zebrafish mutants using transgenic lines and immunolabeling. These studies will reveal novel roles for *gsx1* in the development and function of visual neural circuits.

Program/mechanism supporting research/creative efforts: Biology 486 capstone



Poster 59**The Fungus Among Us: The Impact of Mycorrhizal Interactions on Soil Biogeochemistry**

***Lacey Smith***,\* Nanette Raczka and Edward Brzostek

Field: Biology- Ecology

Student's Major: Environmental Geoscience

Most plants, including trees, have a relationship with fungi that benefits both organisms. Evidence shows distinct differences between trees that associate with arbuscular mycorrhizae (AM) and those that associate with ectomycorrhizae (ECM) in how they access nutrients, impact microbes, and drive soil C. However, many of the trees that have been studied are from one or two families; thereby calling into question whether mycorrhizal association is simply capturing differences in evolutionary relatedness. The objective of this study was to examine the extent to which these associations or phylogeny drive soil biogeochemistry. We conducted research at the Core Arboretum in Morgantown, West Virginia and the Morton Arboretum in Lisle, Illinois. Both Arboretums have the same twenty-five tree species in different geographic locations. We sampled soils in November of 2016 from both sites and separated them into soils that were adjacent to roots or not (i.e., rhizosphere vs. bulk soils). At both sites, we found that mycorrhizal association was a more dominant driver of the activity of enzymes that mobilize nutrients; whereas phylogeny controlled enzymes that drove C cycling. Moreover, mycorrhizal association was directly linked to the stimulation of decomposition in the rhizosphere vs. the bulk soil. These results suggest an important interaction between mycorrhizal association and phylogeny in predicting the response of coupled C and N cycles to global change.

Program/mechanism supporting research/creative efforts: capstone course

Poster 60**Effects of downregulation of cell-wall modifying genes on bud set regulation in *P. trichocarpa******Luke J. Stover*,\* Chanaka Roshan Abeyratne and Stephen DiFazio**

Field: Biology

Student's Major: Biology

In an attempt to enhance the efficiency of biofuel production, research has traditionally focused on wood chemistry in forest trees. Altered wood chemistry has the potential of improving recalcitrance, but could have unintended effects on dormancy. In *Populus trichocarpa* (black cottonwood) changes in dormancy could inhibit annual growth rates or put the trees at risk for frost damage, compromising benefits of genetic engineering. Genome wide association analysis indicates that multiple polymorphisms in and around the Potri.013G001600.1 gene of unknown function have a strong association with bud set date. It is currently unknown to what degree the expression levels of the gene controls the timing of bud set. This experiment aims to isolate the gene and control its transcription levels in order to determine the effects of the gene on bud set dates in *Populus trichocarpa*. Multiple levels of gene expression have been created via RNA interference (RNAi) caused by *Agrobacterium* mediated transformation. Levels of Potri.013G001600.1 gene expression will be tested using quantitative reverse transcriptase polymerase chain reaction (RT-qPCR). All lines will be grown in a growth chamber with controlled lighting and temperatures to induce bud set. Once phenotypes are recorded a linear regression of gene expression and bud set date will be calculated. The direct results of this experiment will show if expression of this gene affects dormancy. This information can then be used to predict if altering other genes involved in wood chemistry may cause altered dormancy.

Funding: Federal-DOE

Program/mechanism supporting research/creative efforts: Biology 486 capstone

Poster 61**The significance of *Sodalis pheA* towards the metabolic integration of tsetse symbiosis*****Hunter White\**** and Rita Rio

Field: Biology

Student's Major: Biology

The tsetse fly (Diptera: Glossinidae) is the obligate vector of African trypanosomes, the causative protozoan parasites of Human African Trypanosomiasis (HAT) and Nagana, a wasting disease of other animals. In addition to potentially harboring trypanosomes, the tsetse fly contains a relatively simple microbiome consisting of three vertically transmitted bacteria that vary in their host relation: the parasitic *Wolbachia pipientis*, the obligate mutualist *Wigglesworthia glossinidia*, and the commensal *Sodalis glossinidius*. Tsetse flies are strictly sanguivorous by nature, which limits their nutrient intake drastically. The microbiome is believed to play multiple roles towards improving host biology, including supplementing the strict blood diet with essential missing nutrients. In the commensal *Sodalis* genome, the retention of the chorismate mutase P/prephenate dehydratase (*pheA*) gene is of particular interest due to its potential involvement in the innate immune response, known as melanization, towards tsetse cuticular wound healing. Additionally, the *Sodalis pheA* gene is believed to integrate with the *Wigglesworthia* chorismate pathway towards the production of the essential amino acid phenylalanine. I hypothesize that by mutating *Sodalis pheA*, the tsetse host will show reductions in melanization response, fecundity, and life longevity. Furthermore, the density of the auxotroph *Wigglesworthia* should be negatively affected by the loss of a functioning *Sodalis pheA* gene due to the loss in the availability of phenylalanine.

Funding: Federal-National Institute of Health

Program/mechanism supporting research/creative efforts: Biology 486 capstone

Poster 62**Computational Energetic Characterization of Interactions between Cell Membranes and pH (low) Insertion Peptide (pHLIP)**

***Austin R. Clark***, \* Blake Mertz, Zachary Bonham, \* Jaycie Saseen, \* Chitrak Gupta, and Thomas Meadows\*

Field: Chemistry

Student's Major: Chemistry

pH (Low) Insertion Peptide (pHLIP) is a peptide with the intrinsic ability to penetrate cell membranes under acidic conditions. As a result of this inherent trait, pHLIP is a potential candidate in delivering therapeutics and diagnostic imaging agents to tissues characterized by acidosis such as cancer, arthritis, and heart disease. In spite of this, our understanding of the energetic contributions of the molecular interactions and the structural features controlling biological function in pHLIP is limited. Through computational modeling, these molecular interactions can be studied at an atomistic level of detail inaccessible to most conventional experimental techniques. The process of pHLIP function has been separated into individual components of binding, helix formation, and insertion: 1) pHLIP in solution; 2) pHLIP at the membrane surface, and 3) pHLIP inserted into the membrane. This project focuses on the formation of helical structure in pHLIP while bound to the membrane surface, a key precursor in the penetration of the cell membrane. By modeling helical formation of pHLIP, we aim to gain an understanding of the energetic contributions of pHLIP-membrane interactions. Our long-term goal is to build a complete thermodynamic picture of pHLIP folding and insertion. These insights will be crucial in our fundamental understanding of how pHLIP can be developed for applications in diagnostic imaging and drug delivery.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 63**Synthesis of Novel Macrocyclic Aromatic Compounds***Josef C. Heller,\** Haresh Thakellapalli and Kung Wang

Field: Chemistry

Student's Major: Biochemistry

Benzene and its derivatives manifest unique electrical and chemical properties as a result of aromaticity, the unique ability of high-energy electrons to resonate around a cyclic structure. By connecting aromatic compounds together in a larger ring, even more novel properties are manifested. Carbon nanotubes are a special example of these macrocyclic structures. Potential uses for these compounds are in organic light emitting diodes (OLEDs), electron storage, and increasing electrical conductivity in plastics. Substituting these compounds with additional functional groups introduces a variety of other properties and is a subject of significant interest in the field of organic synthesis. In this experiment, naphthalene derivatives were reacted to form a dimer that exhibits characteristic fluorescent and electrical properties, but with a unique chemical structure. Rearrangement of atoms around a double-bond produced a product with four fused benzene rings. Further investigation of this compound may result in a new method of forming this type of substructure, or could be the foundation for a method of synthesizing caps for carbon nanotubes.

Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 64**Extension of luminescent group IV metal complexes in photoredox catalysis***Dylan Leary,\** Yu Zhang and Carsten Milsmann

Field: Chemistry

Student's Major: Chemistry

Transition metal photocatalysts have been studied extensively in chemical research. These compounds have been used in various energy applications, especially in solar energy conversion. Additionally, photocatalyst employment in synthetic chemistry has greatly advanced the field, allowing for milder reaction conditions and less complex synthetic strategies. Traditional photosensitizers employ precious metals such as rhodium, ruthenium, and iridium. Since these metals are extraordinarily rare, more abundant alternatives are necessary. Our group has previously synthesized photosensitizers utilizing zirconium, an earth abundant metal. These complexes have been shown to be effective in various organic photoredox reactions, e.g. dehalogenation of  $\alpha$ -bromoesters and reduction of electron-poor olefins. In this study, we've been attempting to examine the effects of installing various functional groups on the ligand framework. We have hypothesized these groups will allow us to fine-tune the electrochemical properties of the zirconium complexes. In addition, we have also been working on extending the scope of our photocatalysts to other early transition metals, particularly hafnium—the heaviest nonradioactive group IV metal.

Funding: Institutional-Don and Linda Brodie Resource Fund

Program/mechanism supporting research/creative efforts: WVU's SURE program



Poster 65

### Pyrolytic Products of Drugs of Abuse

**Olivia Miranda,\*** Stephen Raso and Suzanne Bell

Field: Chemistry

Student's Major: Chemistry

Inhalation of drugs is a common mode of ingestion for drugs of abuse. As the drug is heated, the parent drug breaks down via thermal decomposition ("pyrolysis"), creating new potentially active compounds. These products may be inhaled by both the user and innocent bystanders, which creates an important public health issue that is crucial to understand. Pyrolysis results in either unique thermal degradants or typical metabolites of the parent drug, in which both products may be pharmacologically active. Simulation of the inhalation process is difficult because a smoking environment is irreproducible. Various techniques have been implemented which range from capillary heating followed by extraction to complex smoking instruments such as pyroprobes. With those methods, many highly volatile products, that have a higher potential to enter the lungs, may not be collected. The proposed research's focus is to mimic a smoking environment and collect pyrolytic products that vary across the volatility range that have a high potential to be inhaled by the user. Utilizing a simple and robust apparatus, the method was optimized for flow rate through vacuum pressure control, solvent capture volume, and sample collection. Commonly abused drugs, such as cocaine, heroin, and methamphetamine were pyrolyzed, and all products were tentatively identified using NIST library database and mass spectral analysis or confirmed with reference standards when available.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 66**A Microscale General Chemistry Lab in the Classroom: Inexpensive and Safe Personalized Learning**

***Lindsay Veltri***,\* Tyler Davis, Cassandra Crihfield and Lisa Holland

Field: Chemistry

Student's Major: Chemistry

To reinforce learning in the chemistry setting, research is being conducted to develop innovative, in-hand, classroom demonstrations. However, these microscale laboratories have been avoided due to speed, safety and cost. The research being conducted is developing innovative ways to reinforce fundamental principles in a classroom setting, while appealing to kinesthetic learners; i.e. learners that are often at a disadvantage by learning through passively observing. The goal of this research is to develop new tools to teach chemical reactions, utilizing the reaction between sodium bicarbonate and vinegar to illustrate the conservation of mass, by altering the ratio of reactants and subsequently measuring the volume of carbon dioxide produced. The experiment builds upon fundamental concepts such as the stoichiometry and the limiting reagent of the reaction and further graduates to the ideal gas law to aid in the determination of the final volume of carbon dioxide produced by the reaction. Through said principles, the volume obtained for each manipulation of the reactant concentration, 1:1, 1:2 and 2:1, will yield the same volume of carbon dioxide produced; therefore, illustrating the conservation of mass. The experiment can be carried out in a small window of time with household items, i.e. baking soda and vinegar, and does not require that it be performed within a laboratory setting. Consequently, making it advantageous as it allows for the solidification of important principles through household items; therefore, making it an inexpensive way to build the foundation of basic chemical principles.

Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 67**Estimation of shooting distance via 2D-elemental mapping by Laser Induced Breakdown Spectroscopy (LIBS)*****Mandy Ho,\** Katrina Rupert\* and Tatiana Trejos**

Field: Forensic Science

Student's Major: Forensic Science and Biology

Gun-related criminal investigations require significant information such as the muzzle-to-target shooting distance. Although chemical color tests can be used to reveal the distribution of gunshot residues around a bullet hole, limitations exist within them. These limitations include unstable reagents, flawed selectivity, and swift disappearance of the color itself. Furthermore, chemical color tests lack the ability to reveal elements related to lead-free ammunition and the color reaction can be masked by dark-colored fabrics or bloody samples. This project will therefore explore a new method for distance determination via chemical imaging by Laser-Induced Breakdown Spectroscopy (LIBS). LIBS is a rapid chemical analysis technique that uses a high energy pulsed laser to interact with the sample and provide simultaneous multi-element detection with minimal destruction to the sample. To evaluate its performance, the proposed LIBS method was compared to traditional color tests in terms of limits of detection, selectivity and reproducibility. A set of white cotton shirts were fired from various distances (contact, 6 in, 12 in, 24 in, 36 in) to determine the accuracy of the method. As the high-energy laser scanned the sample, a simultaneous chemical image was formed in few minutes. This chemical image contains information of the spatial distribution of inorganic gunshot residues in the clothing and was used to estimate the shooting distance. The LIBS method offered important improvements over traditional color tests such as speed of analysis, no need for chemical reagents, minimal alteration of the sample and enhanced confidence and objectivity in the results.

Funding: Institutional-Faculty start-up funds

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 68**Effect of Post- Shooting Activity on Distance Determination by Colorimetric Tests**

**Reem Karimi**,\* Melinda Hills\*, Rebecca Walls\*, Jordan Mink\*, Robert O'Brien and Tatiana Trejos

Field: Forensic & Investigative Sciences

Student's Major: Biology and Forensic Investigative Sciences

The purpose of this study is to evaluate the effect of different post-shooting activities on the identification of gunshot residue (GSR) for shooting distance determination. In order to conduct the experiment, 21 cartridges (15 known distances, 6 blind "unknown" distances) were fired into 21 white cotton t-shirts. These shirts were then used to simulate a "resisting arrest" situation in which a researcher put on the unknown shirts to portray an arrestee, while another student portrayed a police officer. The police officer then proceeded to simulate an arrest while the arrestee "resisted". The arrest activities took place a) indoors where the suspect rolled over concrete floor, b) outdoors rolling over glass, c) outdoors rolling over gravel and d) outdoor rolling over dirt/mud. Unknown samples not exposed to any activity were collected as well as control samples from non-shot clean shorts rolled over the substrate (floor, grass, mud, gravel). The known shots as well as the unknown activity shots were packed preserving the areas around the entrance hole and then taken back to the laboratory for further analysis. Standard distance determination tests were conducted using colorimetric tests. The samples shot at five known distances were used to create calibration curve of firing distance versus dispersion radii. Each known distance was shot three times to account for uncertainty of the measurements. The unknown samples were then compared to the firing distance calibration curve to determine whether or not the intrusive activity had an effect on the analysis and distance determination accuracy.

Funding: Institutional-Forensic & Investigative Sciences Department

Program/mechanism supporting research/creative efforts: capstone course

Poster 69**Exploring tree growth during the Anthropocene: the Fernow Experimental Forest as a case study***Kristin Lantz*,\* Justin M. Mathias and Richard B. Thomas

Field: Ecology

Student's Major: Biology

Since the onset of the industrial revolution, global concentrations of atmospheric CO<sub>2</sub> have risen by ca. 34%. Initially, elevated atmospheric CO<sub>2</sub> (eCO<sub>2</sub>) stimulates carbon (C) storage through increased rates of photosynthesis with terrestrial forest ecosystems providing a sink for ~30% of the annually emitted C. However, concurrent with eCO<sub>2</sub>, temperate forests in the eastern United States have experienced anthropogenic disturbance, including pervasive levels of acidic deposition from fossil fuel combustion, which can severely inhibit C sequestration. As a result of legislation of the Clean Air Act of 1970 and its subsequent amendments in 1990, rates of acid deposition have decreased drastically, almost to levels observed near the onset of the industrial revolution. To investigate the effects of these changing environmental parameters on forest health and productivity, I examined growth trends of two economically and ecologically important tree species in the northeastern United States—northern red oak (*Quercus rubra*) and tulip poplar (*Liriodendron tulipifera*)—in two reference watersheds at the Fernow Experimental Forest in Parsons, WV. Increases in growth of both tree species from 1940 to 2015 were highly correlated with increases in atmospheric CO<sub>2</sub>, as well as decreases in wet deposition of oxidized forms of nitrogen and sulfur. These results corroborate countless studies suggesting the stimulatory effect of eCO<sub>2</sub> on forest productivity, but also highlight the efficacy of landmark environmental legislation on the overall health and productivity of forest systems in the Central Appalachian Mountains.

Funding: Federal-National Science Foundation

Program/mechanism supporting research/creative efforts: Summer Intern

Poster 70**Personality mediates the association between Childhood Misfortune and Self-rated Physical Health**

*Jordan L. Harvey*,\* Nicole M. Silva and Nicholas A. Turiano

Field: Psychology

Student's Major: Chemistry and Psychology

Childhood misfortune is a non-normative life event that occurs in childhood that may have detrimental effects on development later in the life span. Research indicates that individuals who experienced childhood misfortune report poorer self-rated physical health (SRH) in adulthood (Irving & Ferraro, 2006; Schafer & Ferraro, 2012), which is an accurate predictor of cardiovascular disease and mortality (Mavaddat et al., 2014). Research also indicates that childhood misfortune can influence individuals' personalities (Morton et al., 2016), which has also been associated with SRH (Okun & George, 1984). However, no known studies have examined whether personality mediates the association between childhood misfortune and SRH. Thus, the purpose of the current study was to examine whether the Big Five personality traits mediated the association between childhood misfortune and SRH in a sample of 6,106 adults (Mage = 46.83, SD = 12.89, Range: 20 – 75) from the Midlife Development in the U.S. Study. PROCESS models were utilized and gender, age, race, marital status, and education were adjusted for. Results indicated that neuroticism (IE = -.007, CIs [-.010 – -.006]) and conscientiousness (IE = -.002, CIs [-.003 – -.001]) significantly mediated the association between childhood misfortune and SRH. Specifically, individuals who experienced childhood misfortune reported endorsing higher levels of neuroticism or lower levels of conscientiousness, which were negatively associated with SRH. These findings highlight that the negative association between childhood misfortune and SRH may be explained, in part, by personality.

Funding: Private-John D. and Catherine T. MacArthur Foundation Research Network on Successful Midlife Development

Program/mechanism supporting research/creative efforts: Voluntary



Poster 71**Parent-Child Interaction Therapy**

***Nila Manivannan\****, Jana El-Khatib\*, Karissa Bjorkgren\*, Allison Thompson\*, April Highlander\*, Lauren Quetsch, Corey Lieneman and Cheryl McNeil

Field: Psychology

Student's Major: Psychology and Biochemistry

Parent-Child Interaction Therapy (PCIT) is an evidence-based treatment for children two to seven years of age with severe disruptive behaviors. Standard treatment delivery occurs in out-patient settings where caregivers come in with their children to learn skills to reduce child problem behaviors, improve the parent-child relationship, and learn effective discipline strategies. Parents must enter the first phase of treatment, Child-Directed Interaction (CDI), to improve the relationship with their child. Once parents have demonstrated mastery of the skills learned in CDI, parents can then move on to the second phase of treatment, Parent-Directed Interaction (PDI), where parents are taught skills to increase their child's compliance. PDI skills include learning how to give commands, how to deal with non-compliance, and praising compliance. What the specific skills in CDI and PDI are and how they are tracked over time will be discussed in the present poster. In addition, unique components of the effective treatment such as PCIT's use of a one-way mirror and a hearing device (i.e., bug-in-the-ear) to help parents acquire skills will also be detailed. Lastly, graduation criteria will be explained.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 72**Shaping Cooperation in Pigeons*****Amanda Ackerman\**** and Kennon Lattal

Field: Psychology

Student's Major: Psychology

This paper is concerned with the analysis of contingencies controlling the behavior of two organisms simultaneously. In doing so we return to a problem of historic interest in behavior analysis, but on which there has been little recent experimentation. Two pigeons were trained to respond on a cooperation task. The task was to peck simultaneously on two metal disks located at either end of a rod which was attached to a wooden toy firetruck. These pecks moved the firetruck down a wooden track. In the terminal performance, reinforcement was delivered when the truck reached the end of the track. Beginning with adapting the pigeons to being in a social environment with one another, a variety of problems were encountered in shaping the cooperative behavior. One of the most difficult problems was coordinating the individual responses toward the common goal of moving the truck. This and other problems will be discussed and illustrated with video clips showing the problem behavior and its resolution. The final cooperative behavior was achieved after several months of training.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 73**Ew, Girls are Gross: Exploring the Relation between Disgust Sensitivity and Sexism***Shelly Boggs,\** Natalie J. Shook and Cameron G. Ford\*

Field: Psychology

Student's Major: Psychology &amp; Criminology

The emotion of disgust evolved to aid in pathogen avoidance and to limit the transmission of diseases. Other people are a primary source of disease transmission. As such, disgust is associated with the avoidance of out-group members and prejudice. Some research has demonstrated that the relation between disgust sensitivity and prejudice is mediated by social conservatism. According to the dual process model, social worldviews mediate the relations between different personality factors or situational threats and conservative values. The purpose of this study was to examine the relations among disgust sensitivity, dangerous world beliefs, conservatism, and sexism. Participants were recruited via Amazon's MechanicalTurk (N = 646; 56% female; Mage = 32.42; 71.7% White), and they completed an online survey that assessed disgust sensitivity, dangerous world beliefs, conservatism, and sexist attitudes. All of the constructs of interest were positively correlated with one another. The relation between disgust sensitivity and sexism was mediated by dangerous world beliefs and conservatism. That is, individuals higher in disgust sensitivity tended to view the world as a more dangerous place. This world view lead individuals to endorse more conservative beliefs and in turn foster more sexist attitudes. Implications of this research suggest that disgust sensitivity plays a role in sociopolitical beliefs and prejudicial attitudes.

Funding: Institutional

Program/mechanism supporting research/creative efforts: Honors Thesis Project

Poster 74**Summer Research Experiences: A Predictor of Science Identity and Science Career Intent**

***Krysta Masters***,\* Patricia Hopkins,\* Paul R. Hernandez and Natalie J. Shook.

Field: Psychology

Student's Major: Psychology

Summer research experiences provide undergraduate students with an opportunity to engage in research and gain a deeper understanding of the research process. Ideally, this experience encourages students to pursue graduate degrees and careers in science. Some studies have found that summer experiences increase a student's science identity and competence (Eagan et al., 2013; Little et al., 2010). The current study built upon this previous literature by assessing whether student's science self-efficacy, science value, science interest, science identity, and career intent each increased over the course of a two-month summer research experience. At three time points (i.e., beginning, middle, and end of the program), 69 undergraduate students participating in the summer research programs at West Virginia University completed surveys assessing science identity, values, interest, self-efficacy, and intent to pursue a research career. Science value and science interest did not change over time. Science identity increased from Time 1 to Time 2, but did not change from Time 2 to Time 3. Science self-efficacy increased at both Times 2 and 3. Finally, research career intent decreased from Time 1 to Time 2, but did not change from Time 2 to Time 3. Summer experiences do not appear to affect science value and science interest. However, summer research does increase a person's science identity and self-efficacy. Interestingly, there was a decrease in research career intent. Even as students felt more confident in their research abilities, they may learn that a research career is not something they want to pursue.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 75**Association Between Childhood Sexual Abuse and Midlife Depression***Paige Patterson\** and Nicholas Turiano

Field: Psychology

Student's Major: Psychology

Although sexual abuse during childhood is not common, for those that do experience it there can be long-term devastating effects on health and well-being. In this study, we investigated the effect of retrospectively reported childhood sexual abuse on depression levels throughout adulthood. Data was collected from the Midlife in the U.S. Study (MIDUS 2), which included 1,255 participants ranging in age from 35-86 years old. A multiple linear regression model was estimated, controlling for CESD, general distress-depressive symptoms, general distress-anxious symptoms, loss of interest, anxious arousal, positive affect, and perceived stress. Experiencing childhood sexual abuse was associated with increased levels of general depression ( $b = .2039$ ;  $p = .001$ ). We also estimated a logistic regression test whether sexual abuse was associated with the odds of exceeding a clinical relevant threshold for a diagnosis of depression. This analysis revealed the same pattern of findings as those experiencing sexual abuse during childhood had a 10% increased odds of being diagnosed as depressed in adulthood ( $OR = 1.095$ ; 95% CI 1.054-1.137;  $p = .001$ ) These findings suggest that sexual abuse does in fact have a significant association with emotional health and depression, even decades after the abuse occurred.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 76**LGBT Prejudice Reduction through Contact: Differences based on Source of Contact**

*Jeanette Pool*,\* Holly Fitzgerald and Natalie J. Shook

Field: Psychology

Student's Major: Psychology

According to the contact hypothesis, one means of reducing prejudice is through increased interaction between group members (Allport, 1954). By increasing contact between individuals who belong to different groups, people can overcome misconceptions or stereotypes, find similarities between groups, and empathize with individuals who belong to a different group. Thereby, negativity toward different groups is reduced and more positive attitudes are formed. However, the benefits of contact may differ based on the type of relationship individuals have with their interaction partner. For example, a close friend may have a greater influence than a family member. The current study examined the extent to which contact with family members, acquaintances, and close friends who identify as Lesbian, Gay, Bisexual, and Transgender (LGBT) predict attitudes toward LGBT groups. In this study, 276 undergraduate students at West Virginia University (73.4% female; Mage = 19; 86.9% white/Caucasian, 6.7% African American) completed an online survey that contained separate measures for prejudice toward each LGBT group. Participants also indicated the number of family members, acquaintances, and close friends that they had who identified with LGBT groups. Individuals with more close friends and acquaintances who identified as LGBT reported less prejudice toward LGBT groups. However, the number of family members who identify as LGBT was unrelated to prejudice. These findings suggest that not all contact is the same and that relationship type moderates the benefits of contact. This research has implications for increasing the inclusion of LGBT individuals at WVU and other campuses nationwide.

Program/mechanism supporting research/creative efforts: a WVU 497-level course



Poster 77**Undergraduate Research in West Virginia University's Psychology Department**

***Maggie Ruckle,\**** April Highlander, Emma Vesheco, Cassandra Drain, Lauren Quetsch, Corey Lieneman and Cheryl B. McNeil

Field: Psychology

Student's Major: Psychology

Participating in research in West Virginia University's (WVU) Psychology Department provides undergraduate students with a wide variety of opportunities in multiple psychological disciplines. WVU students have the option to enroll in PSYC 495, an independent study, for credit hours or on a volunteer basis. While enrolled, students gain a better understanding of how research in the field of psychology is conducted while learning valuable skills like coding behaviors and entering data. Exceptional research faculty and staff aid in students' learning and professional development. Students also establish valuable and professional connections with their advising faculty. Research labs often give undergraduate students the opportunity to work closely with graduate students who may serve as mentors, helping undergraduate students refine their skills and prepare for upcoming graduate studies. This poster will discuss components of a PSYC 495 placement and how it allows students to apply principles they learn in related classes, obtain a better understanding of their future goals, and build upon their professional experiences.

Funding: Institutional-West Virginia University

Program/mechanism supporting research/creative efforts: capstone course

Poster 78**Personality Traits Predict Life Satisfaction Through Coping Behaviors*****Rebecca Stegmann\**** and Nicholas A. Turiano

Field: Psychology

Student's Major: Psychology and English

The current study tested if an individual's Big 5 personality traits could predict life satisfaction in a national sample of 3,810 adults participating in the Midlife Development in the United States (MIDUS) study. While controlling for extraneous variables, several linear regression analyses revealed that those scoring higher in conscientiousness, agreeableness, and extraversion had higher levels of life satisfaction, mainly because they used more effective coping strategies. Conversely, individuals who scored higher in neuroticism were found to have lower levels of life satisfaction because they used less effective coping strategies. No significance was found between an individual's openness to new experiences and their overall life satisfaction. In this study, effective coping strategies included problem-focused coping skills such as planning, positive reinterpretation, and active coping while less effective coping strategies included emotion-focused coping strategies such as disengagement, emotional venting, and problem denial. Further analysis revealed that the problem-focused coping strategy of positive reinterpretation was the strongest mediator of the personality-life satisfaction association.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 79

**Consumer Decisions at Midlife: 50 is not the new 30**

***Jackson Steinbrecher,\**** Abigail M Nehr Korn and Julie Hicks Patrick

Field: Psychology

Student's Major: Psychology

The decision making literature suggests that emotional salience and perceived importance influence decision outcomes. Although people of varying ages make consumer decisions for themselves and assist seniors in making such decisions, relatively little is known about the ways age interacts with perceptions regarding the importance, meaningfulness and difficulty of making such decisions. Data from two related studies examine the affective context of making a decision about a place to live, an automobile to purchase, and which insurance policy to select. Survey data from a large age-diverse sample (N = 447; ages 21 to 87 years) show: 1) decisions about housing are viewed as more important and meaningful than other low-frequency, but common decisions; and 2) decisions about where to live are seen as equally difficult to make as are those about insurance, but more difficult than automobile purchase decisions. These results suggest that when others assist seniors in making meaningful but low-frequency consumer decisions, emotional and cognitive perspectives need to be considered. Study 2 extends these findings to examine whether age and values relate to the quality of consumer decisions made for one's self and for others. Age differences were observed for perceived difficulty of making these decisions. Although fewer than one-third of adults made high-quality decisions in an experimental setting, preliminary analyses suggest few age-related differences in decision process or decision quality. Together, these results suggest ways for the senior service industry to work with individuals and family members of varying ages to support high-quality decisions among seniors.

Funding: Institutional-WVCTSI

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 80**The Role of Future-Mindedness on Adolescent Environmentalism*****Shannon Underwood,\**** Lindsey Bradley,\* Rebecca Olson and Aaron Metzger

Field: Psychology

Student's Major: Psychology

The current study examined the association between future-mindedness and environmental behaviors and attitudes in adolescence. Environmental behaviors and future-mindedness have been found to be associated with similar psychological traits, such as self-efficacy (Arthur et al., 2014), but the potential link between adolescent future-mindedness and environmental behaviors and attitudes has been overlooked in the literature. Therefore, individuals who are future-minded may feel confident in their ability to preserve the environment. Future-mindedness was measured using three items (e.g. I am hopeful about my future), environmental attitudes with two items (e.g. People should work to protect the environment) and environmental behaviors with three items (e.g. I turn off electronics when I'm not using them). Participants were 2435 4th through 12th grade students (Male = 45%; Mage = 13.33, S.D. = 2.66; 44.2% White, 31.2% Hispanic, 10.5% Black, 6.4% Asian, 6.8% other) from California (n = 1023), Minnesota (n = 610), and West Virginia (n = 802). Results indicated that future-mindedness was positively associated with environmental attitudes ( $B = .13$ ,  $S.E. = .05$ ,  $p < .05$ ), but not environmental behaviors ( $B = .02$ ,  $S.E. = .06$ ,  $p = .69$ ). These findings suggest that adolescents who report higher levels of future-mindedness are more likely to have environmentally responsible attitudes, but not necessarily behave in environmentally responsible ways. It is possible that adolescents could possess certain beliefs or ideologies, but may not take the initiative to perform those actions. Future research is necessary to explore potential mechanisms that explain these associations.

Funding: Federal

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 81**A Study on Alternative Sustainable Development Strategies for Mined Lands After Reclamation**

***Morgan Southall,\**** and J. Chris Haddox

Field: Sustainable Design

Student's Major: Landscape Architecture

This study focuses on the development methods and process of Mylan Park, formerly mined and reclaimed land outside of Morgantown, WV. The study covers the history of the site, the reclamation measures, development of the site, current uses, and proposed uses. Aspects including environmental impacts and regulation measures are considered. Concurrently, the study covers alternative, sustainable practices of large development sites, particularly in relation to LEED for Neighborhood and Sustainable SITES Initiative. Case studies of similar sites and developments are also included within the initial research. After compiling existing information, an analysis takes into account case studies, both strategy tracts, the defining characteristics, impacts on land and community, and the potential for failure and success. The final product provides a detailed report on current development practices, alternative development methods, and a proposed strategy with element from both. Suggested is an alternative general development method for similar sites, as well as a site specific approach for further development of Mylan Park. Development options for similar future sites within the Morgantown area is included with a step-by-step procedure.

Program/mechanism supporting research/creative efforts: Independent Study

Poster 82**The Effect of the Olympics on Rio de Janeiro*****Emily Dillon,\* Carrie Digman,\* Matthew Smith\****

Field: Business

Student's Major: Hospitality and Tourism Management

Holding an event such as the Olympics in any city will have great impact on the economy, the infrastructure, and the people living there. In order to be able to host the Olympics, a city such as Rio would need to build thousands of hotel rooms and numerous stadiums to accommodate the extremely increased demand created by the hundreds of thousands of foreign travelers. To prepare for the event, Rio forced thousands of families out of their homes, demolished entire neighborhoods, and rebuilt an area to show the world the wonders of the area. Was it worth it? We analyzed the actions that Rio took and performed a market study on the hotel industry to see if holding the Olympics helped or hurt Rio as a whole. We look at the growth that averaged 11.5 new hotel rooms a day over a year and a half: growth comparable to what New York City is currently undergoing. We look at key performance indicators, such as occupancy levels, revenue per available room, and average daily rate, to compare the Olympics to other large events and to see if Rio ever reached optimum levels. We find that other factors had significant negative impacts and Rio experienced high levels, followed by drastic drops. We analyze their ability to sustain these levels and look into what will be done with the area in the future. This research was presented to Smith Travel Research in an international competition in Fall 2016 and received third place.

Funding: Van Scoy and Bodnar Foundation

Program/mechanism supporting research/creative efforts: Major Courses



Poster 83**Discovering the Best Consumer Complaint Strategies to Gain Compliance from Financial Institutions**

***Natalie Marquart,\**** M. Paula Fitzgerald and Farnoush Reshadi

Field: Business

Student's Major: Marketing

The Consumer Financial Protection Bureau (CFPB) provides a governmental check to ensure financial institutions are correctly implementing the rules and regulations of the industry. Using the CFPB website, consumers can file a complaint narrative that is publicly available. The purpose of this study is to identify the best persuasion tactics when writing their complaint narratives that will lead to the best outcome (i.e., the consumer receives monetary relief and does not request further attention) when they are dissatisfied with a financial service. Specifically, this study is looking at the narratives relating to the credit card industry. We will examine the various persuasion strategies based on the sales, promotion, and justice literatures using NVivo, a state-of-the-art qualitative tool. Three people will code verbatims based on existing theory and then test which of these strategies are related to the best consumer outcomes (issue closed with monetary or non-monetary relief). In a pilot study, we found that consumers use a wide variety of strategies, from expressing negative emotions to identifying certain legal regulations which, in their view, are being violated, to reminding firms of the consumer's loyalty and monetary value. Traditionally, marketing scholars have studied how companies strategize to persuade consumers to purchase their product. This study is significant because we are looking at how consumers are trying to persuade the company to act in their favor. Based on results, we hope to assist consumers when writing complaints to companies in knowing which tactics yield the most return.

Funding: 2016 James and Karen Caveney WVU Alumni Association Faculty Excellence Award

Program/mechanism supporting research/creative efforts: Independent Research Study - Marketing 495

Poster 84**The Role of Affectionate Communication During Childhood on Adult Romantic Relationships**

***Cassidy Bayes,\**** Taylor Gadd and Annabelle Hollen

Field: Communications/Journalism

Student's Major: Integrated Communication Studies

The purpose of this study was to conduct an investigation between the affectionate communication received from a family member during childhood and the affectionate communication later exchanged in an adult romantic relationship. For this study, we classified affectionate communication into three dimensions; verbal statements, nonverbal gestures, and social supportiveness. We were also interested in finding a relationship between affectionate communication during childhood and relational and life satisfaction in adulthood. Participants included 83 undergraduate college students involved in a romantic relationship. The participants completed a survey that included four measurements. The Affectionate Communication Index (ACI) was measured twice, once in regard to a family member and once in regard to the participant's romantic partner. The Relationship Assessment Scale (RAS) and the Satisfaction with Life Scale (SWLS) then were measured. The results indicated partial support for the hypotheses that predicted a positive relationship between affectionate communication received from a family member during childhood and affectionate communication used in an adult romantic relationship. The results also yielded partial support for the hypothesis that predicted a positive relationship between affectionate communication used with a romantic partner and both relational satisfaction and life satisfaction. Unexpectedly, no relationships emerged between affectionate communication received during childhood and both life satisfaction and relational satisfaction during adulthood. The limitations of this study include the broad criterion of a family member, rather than specifically, a parent, as the participants' communicative partner; and the validity of recalling affection received during childhood.

Funding: Institutional-McConnell Chair Ambassador program

Program/mechanism supporting research/creative efforts: COMM 393C

Poster 85**College Roommate's Use of Forgiveness Strategies with Relational Quality and Satisfaction****Vivian****Langford\*** and Michelle Sieminski

Field: Communication Studies

Student's Major: Communication Studies

Research about forgiveness strategies has increased in recent years, especially among different relationship levels. However, little is known about forgiveness strategies among roommates and their friendship level because the majority of former studies have focused on romantic relationships. The purpose of this study was to identify how the different friendship levels determine the forgiveness strategies used among college roommates. Participants were 87 college students who identified as living with a roommate in campus housing. Participants were asked to complete a survey based on a conflict that occurred with their roommate. This study focused on three different types of forgiveness strategies: revenge, avoidance, and benevolence. The study also focused on three categories of friendships that were identified as best friends, casual friends, and acquaintances. Results indicated that forgiveness strategies differ among best friends, casual friends and acquaintances in that the benevolence forgiveness strategy is most commonly used in higher quality friendships and associated with higher levels of satisfaction. Future research could examine roommate relationships over two semesters rather than a single one, and examine roommate relationships outside of university housing.

Program/mechanism supporting research/creative efforts: McConnell Chair Ambassador Program

Poster 86**Peer Feedback among High-Ability Versus Low-Ability Reviewers**

***Nathan Altman***,\* Aubree Kiser,\* Erica Tracewell,\* Zachary Carowick, Megan Mikesell and Melissa Patchan

Field: Education

Student's Major: Psychology

Peer reviewing is a popular technique in higher education used to provide students with feedback about their writing. Many studies have demonstrated the positive outcomes associated with peer feedback, but what is still unknown is how the ability of the reviewer affects the content of the feedback that they provide. The present study was conducted using peer feedback from 130 participants enrolled in an Introduction to Philosophy course. Participants were required to write two papers and reviewed four peers' drafts of each paper. The participants were divided into two groups (i.e. high-ability reviewers and low-ability reviewers) based on their writing ability, which was used as a proxy for the participants' reviewing ability. The feedback was segmented into 11,480 comments, which were coded into the categories of praise, problem, or solution. A series of between-subject t-tests were used to analyze the feedback provided by the high-ability reviewers and low-ability reviewers. Low-ability reviewers were hypothesized to provide more praise comments, and high-ability reviewers were hypothesized to provide more problem and solution comments.

Program/mechanism supporting research/creative efforts: WVU 490EDP

Poster 87**How Peer Reviewer Ability Influences Praise and Critical Feedback?****Joseph McNeill,\*** Bernadine Kwan,\* Hannah Westley,\* Zachary Carowick, Megan Mikesell and Melissa Patchan

Field: Education

Student's Major: Psychology

Providing feedback on written assignments can be beneficial for a writer. However, the feedback from some peer reviewers may not always be helpful. In this research, 130 participants in an undergraduate Introduction to Philosophy course wrote two papers. Each student reviewed four peers' drafts per paper, for a total of eight drafts. Feedback from peer reviewers was segmented into 11,480 comments, and each comment was coded for praise, problem, and solution. All peer reviewers were hypothesized to give more praise to high-quality text since these texts are more likely to include things that were done well (e.g., better flow, clearer ideas, stronger support). We also hypothesized that higher-ability reviewers are likely to provide more critical feedback (i.e., comments with problems or solutions) because these reviewers hold a high standard in their reviews as they do with their writing when doing peer review. To test these hypotheses, we will conduct a series of independent t-tests that compare the amount of praise, problems, and solutions provided by higher-ability reviewers versus lower-ability reviewers.

Funding: Federal

Program/mechanism supporting research/creative efforts: WVU Work Study

Poster 88**Comparing the Number of Peer Feedback Comments Between Subsequent Papers****Audrey Weiss,\*** Courtney Wild,\* Zachary Carowick, Megan Mikesell and Melissa Patchan

Field: Education

Student's Major: Psychology

Although peer feedback has become more prevalent as a learning tool, its long-term effects have been left unexplored. For example, how do peer reviewers' feedback grow between two papers over the course of a semester? Participants were derived from an introductory philosophy course resulting in a total of 130 college students. They were classified as either high-ability reviewers or low-ability reviewers based on their writing skills. All participants were asked to write two papers, and then reviewed four peers' drafts per assignment. Their feedback was divided into 11,480 comments that addressed unique issues. These comments were coded to reflect whether they contained praise, problems, and solutions, and two competing hypotheses were tested. The first hypothesis stipulates that the number of comments per reviewer would increase due to the practice effect while the second predicts a decrease due to higher quality papers. A series of paired t-tests will be conducted to determine how the number of praise, problems, and solutions differ across papers.

Program/mechanism supporting research/creative efforts: EDP 495



Poster 89**La Negra Tiene Tumbao: Multimodal Resistance Strategies of Afro-Latinxs and Other Queer Constructions***Kassandra Colón Cisneros\**

Field: Gender Studies- History, Latin American Studies

Student's Major: Latin American Studies, Women and Gender Studies

The importance of sound in afro-diasporic communities hearkens back to the slave cry on the plantation field—a sound that showed there is social life within social death. The cry manifested itself within new communication models. This sound was a rumbling of resistance, allowing a slave's survival mechanism to transcend plantation fields controlled by white slave masters. These survival strategies still exist today, whether it's through Cecilia Cruz's song "La Negra Tiene Tumbao," which becomes sound that affirms the beauty of Afro Latinas in white spaces, or through Calle 13's song "Atrévete Te Te," which becomes a sexual "coming out" narrative. These resistance strategies are not limited to music; they can also be traced through aesthetics, as well as routes and history that connect afro-latinos to the diaspora. The deployment of diasporic resistance through what Juan Flores calls "baggage," show the possibility and radical potential for survival in white spaces. Recognizing the necessity to dismantle white heteronormative spaces, my research will analyze how afro-latinos, survive using tools of resistance that can be traced back to the afro-diaspora. I will contextualize this method beyond survival mechanisms to their influence of queer afro latinx spaces. Through understanding Latinx communities in a diasporic context, I will reveal how an aural politic of resistance, which is tied to the sound and aesthetic of the diaspora, disrupts a legacy of antiblackness. My analysis will be framed through the genealogy of the afro-diaspora and will explain how our understandings of afro-diasporic communities transcend into current interpersonal relationships.

Funding: Institutional

Program/mechanism supporting research/creative efforts: a WVU 497-level course



Poster 90**Perceptual Training in Speech Motor Control: What is learned?**

***Melissa Bero***,\* Jackie Smith and Kimberly Meigh

Field: Communication Sciences and Disorders

Student's Major: Communication Sciences and Disorders

This study aimed to understand what specific information participants learned during a listening task. Participants listened to nonsense words, termed nonwords, to investigate what aspects of the nonwords participants learned during listening. Two particular nonword variables were investigated: syllable stress patterns, i.e., which part of a word contained more emphasis (such as an increase in loudness), and phoneme representation, i.e., what speech sounds within the word were heard. During the experiment, participants listening to a nonword and made decisions regarding syllable stress by pressing a button on a response box. Results suggest that participants' responses are influenced by speech sound and not syllable stress patterns (even though syllable stress was part of their training experience). These results were compared to an identical study where production training occurred. During production training, participants had to repeat the same nonwords and stress patterns. The results of both tasks, regardless of training by listening or by repeating the nonword, were identical. Participants' responses were influenced by speech sounds, and not syllable stress patterns, when training in a perceptual (i.e., listening) or production (i.e., speaking) task. Our results suggest that the mode of training (either perceptual or production) encodes the same type of speech information. Generally, this research provides evidence that listening tasks and speaking tasks may be used to influence speech production. Future research may examine this effect in clinical populations, e.g., children with articulation errors, to see if learning by listening, as well as by speaking may increase overall treatment success.

Funding: Institutional-Grace Clements Research Award, Dept. of CSD, WVU

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 91**Humor Orientation and Relational Maintenance Behaviors in College Students' Romantic Relationships**

*Katherine Burgess*,\* Erika Hamlin\* and Jacob Long

Field: Communication Studies

Student's Major: Communication Studies, Women's and Gender Studies

Goodwin and Tang (1991) found that humor is perceived to be an important part of a relationship, whether it is a platonic or a romantic relationship. The purpose of this study was to examine the relationship between an individual's humor orientation and their usage of relational maintenance behaviors (i.e., positivity, understanding, assurances, relationship talks, self-disclosure, sharing tasks, networks) in romantic relationships. A total of 86 college students in romantic relationships participated in this research and completed two surveys. One survey asked about their predisposition to use humor, and the other asked about behaviors used to maintain their relationship. It was found that humor orientation had a positive relationship with the usage of relational maintenance behaviors, however there were no sex differences in the usage of these behaviors. These results support previous findings that suggest humor has a positive relationship with romantic relationships. Future research should focus on the different styles of humor and their effect on the types of relational maintenance behaviors used.

Program/mechanism supporting research/creative efforts: McConnell Chair Ambassadors Program

Poster 92

**Analyzing Written Descriptions to Measure Learning from Games**

***Emily B. Louk***,\* Joe A. Wasserman and Nicholas David Bowman

Field: Communication Studies

Student's Major: Communication Studies

Research has shown that learning can be improved through games. This study investigated the first step in this process, which is often ignored in games and learning research: learning the game itself. Although the overall purpose of the study was to investigate the influence of different forms of games on how people understand them, this poster specifically focuses on one measurement of this understanding. In the lab, pairs of participants played Hive, a two-player board game. Afterward, participants filled out a survey including open-ended questions asking participants to identify strengths and weaknesses of the types of pieces in Hive. Subsequently, the first two authors coded this data. Coding involves applying rules to open-ended data, like written descriptions, to analyze it for features of interest. If the data matches a rule, it is marked 1 for that rule. Otherwise, it is marked 0. These rules are combined into a codebook. Two researchers coded to reduce the influence of one individual's interpretations. We analyzed agreement between both coders, or intercoder reliability, which involves two or more people coding data to ensure that the rules of a codebook are applied consistently. This coded data will be incorporated into future analyses to understand how people learn from games. During the poster session, the first author will be able to discuss her role in data collection, conducting research in general, and the coding process including intercoder reliability.

Program/mechanism supporting research/creative efforts: Communication course 491 and 495

Poster 93

**"Exitability" and Institutional Quality: Evidence from the United States**

***Jennifer Mangano***\* and Joshua Hall,

Field: Economics

Student's Major: Economics

There exists a large literature on the relationship between market-oriented policies, also referred to as "economic freedom," and economic outcomes such as growth or inequality. In recent years, a few papers have explored the determinants of economic freedom across countries and states. There is considerable variation in the level of economic freedom from state to state. A reason given in the international literature for variations in economic freedom is that greater ability to "exit" – i.e., move to another government in order to avoid restrictions – is positively associated with higher levels of economic freedom. In these models, "exitability" is often measured by border length. In this paper, I empirically test this theory using data from the 50 U.S. states. I find empirical evidence that states with longer borders have higher levels of economic freedom, controlling for other factors known to influence state-level economic freedom such as climate, government origin, and whether or not the state is considered to be southern.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 94

**Types of Supportive Communication: How College Students Cope with Test Anxiety**

Andre Davis, *Brenna Orr*,\* Taja White

Field: Communication Studies

Student's Major: Communication Studies

The purpose of this study was to examine the relationship of test anxiety and supportive communication among college students. Specifically, this study examines the four types of supportive communication: informational support, esteem support, motivational support, and venting support. This study examined which of these types of support from peers was most helpful in coping with test anxiety and which they felt was most important overall. It also explored whether class rank (i.e., freshman, sophomore, junior, senior) had any difference in students' level of test anxiety. Participants were 145 undergraduate students in a lower level communication course who completed a questionnaire containing the Test Anxiety scale and the Supportive Academic Support Scale. The results indicated that test anxiety does not differ significantly between undergraduate students. Furthermore, the results found that students seek informational, esteem, and venting support from peers, and state that esteem and venting support is important to seek. There are multiple avenues that future research can examine. For example, measuring the outcome of exams that students take and comparing these scores with how important they perceive various forms of social support to be.

Program/mechanism supporting research/creative efforts: McConnell Ambassador Program

Poster 95

**Relational Attitude Self-Disclosures in Romantic Relationships after Parental Divorce**

Alexandra Vaughn,\* Janelle Vickers,\* *Kaitlyn Whyte*\* and Lauren Opatick\*

Field: Communication Studies

Student's Major: Communication Studies

The purpose of this study was to investigate how children of divorce and children of intact families self-disclose to their romantic partners. The data collected were from 90 undergraduate student participants (28 men, 62 women) over the age of 18 years old at a large, Mid-Atlantic University. Eligibility for participating in the study included being a college student as well as being in a romantic relationship. The students completed a modified version of Jourard and Lasakow's (1961) Sixty-Item Self-Disclosure Questionnaire to assess the differences in self-disclosure between adult children of divorce and adult children of intact families. There were no significant differences found between children of divorce and children of intact families regarding their self-disclosures of attitudes toward relationships, interests, work, money, personality, and well-being to their romantic partners. There were also no significant differences found in the amount of disclosures between adult children of divorce and adult children of intact families regarding these relational attitudes with their romantic partners.

Program/mechanism supporting research/creative efforts: McConnell Chair Ambassador Program

Poster 96

### Perceptions of Force in American Policing

*Alec Corapinski\** and James Nolan

Field: Sociology

Student's Major: MDS

This research is set to identify the influences that lead individuals to use force in American society in relation to policing. It will identify the demographic and social psychological factors that influence perception of force and the actual application of that force. This research will shed light on the factors that form one's perceptions that influence decisions to use force and to what extent to use such force. It will address the issues and perceptions related to the problem of "Monday morning quarterbacking" Use of Force incidents. The resulting data will allow Law Enforcement to address the root causes, disparities and perceptual issues relating to use of force. It will help educational institutions to adjust their curriculum to help better prepare those seeking LEO positions. It will help communities to address issues that may be leading to apparent disparities in the use of force. Hypothesis Specifically, the hypothesis is that socio-economic, ideological and gender backgrounds of the respondent's will influence a) their perception of the amount and severity of force used by Law Enforcement; b) the severity of force they will use in Use of Force scenarios; c) their chances of being a victim of police force; d) their opinions of Law Enforcement and law enforcement officers e) their perception of Use of Force before and after simulated incidents.

Program/mechanism supporting research/creative efforts: Voluntary



Poster 97**Paintings of People in Places; a Renaissance Update*****Patrick Bayly\****

Field: Creative Arts

Student's Major: Fine Art – Painting

In the Renaissance, a relationship between humans and the space in which we exist was developed in order to create life-like paintings and harmonious buildings. The method to establish this relationship is called Scientific Perspective. The proliferation of rectilinear buildings and cameras reinforces this understanding of our relationship to our space through images. In an update of the method, I began to take pictures of people around town, and compose them into scenes in which they might plausibly exist. Figures (images of human bodies) were isolated and arranged into a new setting according to the color and direction of light in the original space. In this way, those who were not together interact in a new world. Realist painting is an impossible game: you win when you turn canvas into flesh. But, the falseness inherent in the process widens the gap between fiction and reality just enough to make it a tempting leap. Photography is considered factual—it is regularly used as evidence of things that happened. These paintings began as many photographs taken in different places over a wide range of time, and reach most viewers as photographic reproductions. They are inseparable from photography. However, a painting which looks like a photograph induces a confusion of medium through which the documentary quality of photographs slip into the realm of narrative painting. Simply, we see these paintings and believe the events they show happened because they look like photographs.

Program/mechanism supporting research/creative efforts: The Diamond Shop: an art studio on High Street



Poster 98

**Law and Order's Olivia Benson through a Foucauldian Lens**

*Elana Zambori\**

Field: Gender Studies

Student's Major: Women and Gender Studies

Benson is often regarded as a heroine who mirrors echoes of the past feminist waves, because she is dedicated, seasoned, and tough. As a working woman in society with a successful rewarding career, she works to help oppressed groups find their voice, gain back their inner power, and sense of self. Michel Foucault, supporter of feminism, father of post-structuralism, and author of *The History of Sexuality*, is well-known for his theories on power and discourse. Foucault defines discourse as ways of constituting knowledge with social practices and how they relate to one another. Discourse is more than just a way of thinking and assigning meaning, but a system of thoughts that systematically construct people and the worlds of which they speak. He analyses knowledge about sex in terms of social, physical, and emotional power, and believes that power is transferable, or can be transferred. In other words, there is no hierarchy of power, the distribution of power changes. He writes, "Power is everywhere; not because it embraces everything, but because it comes from everywhere....Power is not something that is acquired, seized, or shared, something that one holds on to or allows to slip away; power is exercised from innumerable points." So if we were to draw upon the Foucauldian concept of power being based on the premise that power is mobile and transferable, then we one could argue that the character of Olivia Benson is a heroine that transfers the power taken from survivors of sexual assault.

Program/mechanism supporting research/creative efforts: Voluntary

Poster 99**Economic Warfare to Humanitarian Relief: Great Britain during the Napoleonic Era***Lauren Griffin\** and Katherine Aaslestad

Field: History

Student's Major: International Studies, History

War creates economic hardships, population displacement and impoverishment. Although Great Britain avoided military occupation, decades of economic warfare with France generated distress at home and abroad. Smuggling emerged as a way to supply the continent with goods and provide for the war effort. Due to destroyed trade networks, war demands, new taxes, and the destruction of rural economies, the Continent faced widespread poverty. Smuggling became a shadow economy supported by the British to continue trade and undermine Napoleon's Blockade. By 1813, the Napoleonic Wars ravaged German communities. Some cities faced siege conditions or the horrors of combat. The harsh conditions generated displacement, war refugees, and economic crises, but also inspired a humanitarian response in which Great Britain established philanthropic organizations to ease the hardships. These relief efforts were sponsored by churches, German expatriates, merchants, abolitionists, and others. This research project has several related goals: to explore the English experience of war through economic warfare and smuggling, and the English response to continental war through humanitarian aid. I seek to reveal connections between these two areas of inquiry in merchant networks. The communication between German and British merchants throughout the war may have generated empathy for those facing the conflict on the continent. I am currently exploring the British press, primary source correspondences, and financial reports, as well as mapping geographical sites of donors. The results of this research project will offer broader insights into Great Britain's war experience, and also reveal connections between communities in the midst of modern war.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 100

### History of Jack Roberts Park Stone Wall

*Sarah Hanna\** and Jenny Boulware

Field: History

Student's Major: History

This research focuses on the history of a stone retaining wall at Jack Roberts Park in First Ward neighborhood in Morgantown, West Virginia. The wall collapsed in the fall of 2015, and the Board of Parks and Recreation Commissioners (BOPARC) and the First Ward community are evaluating how to proceed with the repairs. Historical significance, safety, practicality, and cost will be factors in deciding how to best take action. In addition, the First Ward community has requested guidance in finding the history of the wall and park, and hopes to install informational signs at the site. This ongoing research seeks to outline the potential historical significance of the wall, and reveals an evolution of a public site to meet the needs of the community. Jack Roberts Park is the former site of First Ward School. The stone retaining wall was thought to have been built by the Works Progress Administration during the Great Depression. However, this research shows that the Morgantown Board of Education funded and built the retaining wall in 1912. Moreover, the research suggests that John Madigan, for whom a street in First Ward is named, was involved in the construction of the wall. This research draws primarily upon Monongalia County Board of Education records.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 101

**Saye No More**

***Morgan McMinn\**** and Kate Staples

Field: History  
Student's Major: History

The English Court of Chancery was a court of conscience, decisions were judged on testimony verbally given, not on submitted evidence. In the case of *Flower v Backeton*, 1540, Richard Flower contested a verdict made in another local London court that demanded he pay Edmund Backeton for saye cloth bought for his house. The saye cloth acted as a contract and each man viewed the contract differently. Flower thought the contract was between a friend, Thomas Palmer, who acted as the purchaser of the saye, and Backeton. However, Backeton saw the contract as a direct connection to Flower because the saye was destined for Flower's home. Using the lens of material culture, the study of how objects are being used by people, allows me to see the saye cloth acting as the contract binding them together despite the men's differing views. In turn, this lets me suggest that the Court of Chancery records hold more value for the historian beyond what formulaic debt cases might at first suggest. This poster demonstrates that this court record can be used to reveal the intricacies and complexities of business dealings by displaying connections to trade, craft guilds, and politics.

Program/mechanism supporting research/creative efforts: a WVU 497-level course

Poster 102

**The Holocaust in American Culture: 1940s-1960s**

***Anna Schles\****

Field: History  
Student's Major: History and English

In this paper, American culture during the period between the beginning of the Holocaust and the mid-1960s will be examined through analysis of Americans' everyday expressions of their convictions and perceptions and through analysis of popular culture. Here, popular culture will be defined as the culture reflected through forms of mass communication, such as literature, film, and music. Although the mid-1960s is often considered to be the beginning of the period at which the consciousness of the Holocaust in the United States experienced its principal shift towards greater recognition and remembrance, the period from before the United States' entrance into World War II through the World War II period and the postwar years was indubitably itself a time of momentous revelations about the Holocaust. Americans' view of the Holocaust changed between 1940 and the mid-1960s; firstly, the United States' entrance into World War II precipitated the end of a cultural debate about the moral qualities of Nazism, a debate in which the Nazis' rhetoric and conduct of antisemitism played a large role; secondly, the revelation of the extent of the Holocaust during the war caused an emotional response among American Jews, as well as organization for aid and the beginning of commemoration; and thirdly, the postwar years saw a rise in informal commemoration in the American Jewish community and the slow rise of grappling in popular culture with the tragedy of the Holocaust.

Program/mechanism supporting research/creative efforts: capstone course

Poster 103

**An Analysis of Mental Illness in Early 20th Century Mexico**

***McKenna Williamson\****

Field: History

Student's Major: History, World Languages, Literatures, and Linguistics

In early 20th century Mexico, mental illness was very seriously misunderstood in society. This study tries to show the perception of mental illness. I will use a combination of primary and secondary sources to demonstrate that mental illnesses were very misunderstood. One of the primary sources I will use is a murder trial of a woman with epilepsy who was treated as if epilepsy was a mental illness. Using this source and others, and secondary sources the goal of my study will be to create a comprehensive picture of the state of mental illnesses and the mentally ill in turn of the century pre-Revolution Mexico and then show that it was very misunderstood. Then, I will proceed to discuss how this misconception affected the lives of many people. One such example of this is the woman involved in the murder trial who had epilepsy. This study is significant because it is a subject that has not been examined very much.

Program/mechanism supporting research/creative efforts: History 439 and History 497

Poster 104

**A Stilted Shift: The Southern Vowel Shift in Midland Appalachia**

***Krislin Nuzum,\* Janelle Vickers,\* Olivia Grunau\* and Kirk Hazen***

Field: Linguisticsq1`

Student's Major: English

The West Virginia Dialect Project, established by Dr. Kirk Hazen in 1998, studies language variation in Appalachia and teaches the public about language in the Mountain State. Our current study focuses on vowels systems in WV. Vowels were chosen for two reasons: there is limited data on these systems, and vowels better indicate changes in regional characteristics, differences in social class, and most importantly the evolution of Appalachian identity over time. Our research analyzes the progression of the Southern Vowel Shift (SVS) throughout the state. Progress has been intermittent despite the state's southern designation, so we ask if this uneven progression a result of evolving demographics in Southern Urban centers, or if it is due to the stigmas placed on SVS. Our study investigates sociolinguistic interviews of 67 native Appalachians. Using FAVE, 51,000 vowels were analyzed for numerous measures. Linear mixed models were used to discern statistical trends and handle random variables. This paper focuses on the front vowel patterns of the SVS. Through the analysis of native West Virginian speakers, we have found correlations between vowel pronunciations and social information. Younger speakers vary in their productions of /i/ (as in kit) and /e/ (as in dress) depending on factors such as rurality and social class. The changes in /i/ and /e/ have become sociolinguistic stereotypes in WV, associated with rurality and negative traits. This diversity in WV vowels demonstrates diversity among Appalachian identities, and shifting vowel systems factor into the evolution Appalachian speech.

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Program/mechanism supporting research/creative efforts: Voluntary