West Virginia University.
OFFICE OF UNDERGRADUATE RESEARCH

NSF

THE 11TH ANNUAL

SUMMER UNDERGRADUATE RESEARCH SYMPOSIUM

THURSDAY, JULY 25, 2019
ERICKSON ALUMNI CENTER
WEST VIRGINIA UNIVERSITY

- WVU SURE
- ROBOTICS REU
- CHEMISTRY REU
- CANCER SURF
- SUPRE
- LSAMP
- IMMB INTERNSHIP

Summer Undergraduate Research Symposium 2019
West Virginia University

Thursday July 25, 2019

Erickson Alumni Center, Ruby Grand Hall

I. Approximate Schedule of Events

8:30-8:55 am	Poster Setup ─ *Presenters arrive, register, and put up posters. Presenters must leave Alumni Center by 8:55 am and return during assigned, judged presentation time.*
9:00-11:30 am	Poster judging ─ *Only scheduled presenters & not open to public (all presenters return at 11:30 am)*
11:30 am-12:00 pm	Break/Lunch ─ *Judges and presenters first priority, please.*
12:00-12:30 pm	Welcome and Keynote Speaker ─ *All welcome: parents, research mentors, graduate and undergraduate students, and general public.* • *Welcome: Dr. Michelle Richards-Babb, Professor & Director of the Office of Undergraduate Research, WVU* • *Introductory Remarks: Dr. Damien Clement, Associate Professor & Acting Dean of the Honors College, WVU* • *Keynote Speaker: Dr. Earl Scime, Interim Dean of Statler College, West Virginia University*
12:30-2:30 pm	Poster Presentations ─ *Open to all and concurrent with final poster judging.* ***Judges have preference!***
2:30-3:00 pm	Awards Ceremony, Closing Remarks, and Group Photos
3:00 pm	Poster Take-Down ─ *Any posters remaining after 3:30 pm will be removed by the staff.*
3:05 pm	*Post-questionnaires (REU & SURE participants)*

II. Poster Judges

Judge	WVU Affiliation	Category Judging
Christopher Rota	Wildlife & Fisheries Res., Davis College	*Agricultural & Environmental Sciences*
Michael Gutensohn	Horticulture, Davis College	*Agricultural & Environmental Sciences*
Dana Huebert Lima	Biology, Eberly College	*Biological Sciences*
Rachel Baur	Microbiology, Immunology, and Cell Biology, School of Medicine	*Biological Sciences*
Fernando Lima	Chemical Engineering, Statler College	*Engineering*
Kathrine Curtin	Mechanical Engineering, Statler College	*Engineering*
Robin Hissam	Chemical Engineering, Statler College	*Engineering*
Rachel Tallman	Medicine, School of Medicine	*Health Sciences*
Samuel Sprowls	Pharmaceutical & Pharmacological Sciences, School of Pharmacy	*Health Sciences*
Tasneem Arsiwala	Pharmaceutical & Pharmacological Sciences, School of Pharmacy	*Health Sciences*
Catherine Blackwood	Microbiology, Immunology, and Cell Biology, School of Medicine	*Health Sciences*
Michael Jones	Political Science, Eberly College	*Human Engagement**
Elizabeth Satterfield	Public History & Public Administration, Eberly College	*Human Engagement**
Candice Brown	Neuroscience, School of Medicine	*Neuroscience*
Maryssa Beasley	Chemistry, Eberly College	*Physical Sciences*
Brian Dolinar	Chemistry, Eberly College	*Physical Sciences*
Ned Flagg	Physics & Astronomy, Eberly College	*Physical Sciences*
Jeffrey Hughes	Psychology, Eberly College	*Social & Behavioral Sciences*
Jerin Lee	Psychology, Eberly College	*Social & Behavioral Sciences*

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

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

III. Undergraduate Participants and Faculty Research Mentors

A. Research Experiences for Undergraduates (REU) Site: Research in Chemistry at West Virginia University (PI: Brian Popp; co-PI: Michelle Richards-Babb; Assistant to Director: Steve Knowlden)

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
Alyson Fulton	Physical Sci #3 (10:30 am)	Chemistry	Shippensburg U.	Lisa Holland, Chemistry
Mason Hamilton	Physical Sci #4 (9:30 am)	Chemistry	West Liberty U.	Brian Popp, Chemistry
Randall Koziel	Physical Sci #6 (9:30 am)	Chemistry	Indiana U. of PA	Brian Popp, Chemistry
Trey Maddaleno	Physical Sci #9 (10:30 am)	Chemistry	Truman State U.	Fabien Goulay, Chemistry
Keven Medina	Physical Sci #10 (9:30 am)	Industrial Chemistry	Universidad de Puerto Rico - Humacao	Jessica Hoover, Chemistry
Quaterio Richardson	Physical Sci #15 (10:30 am)	Chemistry	Coker College	Luis Arroyo, Forensics
Sarah Riggin	Biological Sci #11 (10:30 am)	Chemistry	Stevenson U.	Blake Mertz, Chemistry
Emily Ruiz	Physical Sci #16 (9:30 am)	Chemistry	Thomas More U.	Glen Jackson, Forensics
Rebecca Rutherford	Physical Sci #17 (10:30 am)	Chemistry	Fairmont State U.	Carsten Milsmann, Chemistry
Katelyn Taylor	Biological Sci #16 (9:30 am)	Chemistry	Saint Vincent C.	Justin Legleiter, Chemistry

B. Robotics Research Experiences for Undergraduates (REU) Site (PI: Yu Gu; co-PI: Jason Gross)

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
[a]Alexandra Collins	Engineering #6 & #8 (9:30 am)	Electrical Eng.	WVU	Yu Gu, Mechanical & Aerosp. Eng.
Neel Dhanaraj	Engineering #6 & #8 (9:30 am)	Mechanical Eng.	Worcester Polytechnic Inst.	Yu Gu, Mechanical & Aerosp. Eng.
Casey Edmonds-Estes	Engineering #6 & #8 (9:30 am)	Computer Sci. & Neuroscience	Bowdoin College	Yu Gu, Mechanical & Aerosp. Eng.
Henry Gunner	Engineering #6 & #8 (9:30 am)	Physics	Centre College	Yu Gu, Mechanical & Aerosp. Eng.
Aleks Hatfield	Engineering #6 & #8 (9:30 am)	Mathematics & Computer Sci.	Concord U.	Yu Gu, Mechanical & Aerosp. Eng.
Nathan Hewitt	Engineering #6 & #8 (9:30 am)	Computer Eng.	U. North Carolina – Charlotte	Yu Gu, Mechanical & Aerosp. Eng.
Rachel Jarman	Engineering #6 & #8 (9:30 am)	Mechanical & Materials Eng.	Loyola U. Maryland	Yu Gu, Mechanical & Aerosp. Eng.
[a]Tucker Johnson	Engineering #6 & #8 (9:30 am)	Mechanical & Aerosp. Eng.	WVU	Yu Gu, Mechanical & Aerosp. Eng.

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
Julz Maffeo	Engineering #6 & #8 (9:30 am)	Mechatronics Eng. Tech. & Elec. Eng. Tech.	California U. of Pennsylvania	Yu Gu, Mechanical & Aerosp. Eng.
Jeongwoo Seo	Engineering #6 & #8 (9:30 am)	Mechanical Eng.	Vanderbilt U.	Yu Gu, Mechanical & Aerosp. Eng.
[a]Henry Vos	Engineering #6 & #8 (9:30 am)	Computer Sci. & Computer Eng.	WVU	Yu Gu, Mechanical & Aerosp. Eng.
[a]Lunet Yifru	Engineering #6 & #8 (9:30 am)	Mechanical & Aerosp. Eng.	WVU	Yu Gu, Mechanical & Aerosp. Eng.

[a]Funded by WVU's Statler College, and the Department of Mechanical & Aerospace Engineering and the Lane Department of Computer Science and Electrical Engineering.

C. WVU Summer Undergraduate Research Experiences (SURE) Site (Coordinator/Director: Michelle Richards-Babb; Graduate Teaching Assistants: Kacee Caster and Grace Childs)

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
Maxwell Adams	Biological Sci #1 (10:30 am)	Biochemistry	WVU	Nik Kovinich, Genetics
Grace Belknap	Soc & Behav Sci #1 (10:30 am)	Anthropology	WVU	Susanna Donaldson, Sociology & Anthropology
Swagat Bhattacharyya	Engineering #2 (9:30 am)	Electrical Engineering	Purdue U.	David Graham, Computer Sci. & Electrical Eng.
Reese Boucher	Physical Sci #1 (10:30 am)	Physics	WVU	Aldo Romero, Physics
Sara Bravo-Peterec	Human Engag #2 (9:30 am)	International Studies	WVU	John Kilwein, Political Science
John Burke	Engineering #4 (9:30 am)	Mechanical Engineering	WVU	Kostas Sierros, Mechanical & Aerosp. Eng.
Hannah Cohen	Neuroscience #1 (10:30 am)	Biomedical Engineering	WVU	Jessica Allen, Chemical & Biomed. Eng.
Colin Colombo	Biological Sci #2 (9:30 am)	Mechanical Engineering	WVU	Jeremy Dawson, Computer Sci. & Electrical Eng.
Tabitha DeBat	Physical Sci #2 (9:30 am)	Forensic and Investigative Science	WVU	Jacqueline Speir, Forensics & Inv. Sci.
Sara DeJarnett	Agric & Env Sci #1 (10:30 am)	Human Nutrition and Food	WVU	Melissa Ventura-Marra, Human Nutrition & Foods
Kendal DeMarco	Agric & Env Sci #2 (9:30 am)	Animal and Nutritional Sciences	WVU	Joe Moritz, Animal & Nutritional Sci.
Christopher D'Emidio	Agric & Env Sci #3 (10:30 am)	Environmental Geoscience	WVU	Steve Kite, Geology
Katelyn Frock	Biological Sci #4 (9:30 am)	Biology	WVU	Bradley Webb, Biochemistry
Lauren Giesler	Neuroscience #3 (10:30 am)	Psychology	WVU	Cole Vonder Haar, Psychology

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
Morgan Glass	Biological Sci #5 (10:30 am)	Biochemistry	WVU	Bradley Webb, Biochemistry
Savannah Hays	Neuroscience #4 (9:30 am)	Biomedical Engineering	WVU	Shuo Wang, Chemical & Biomed. Eng.
Jessica Hogbin	Human Engag #4 (9:30 am)	History, Italian & Relig. Studies	WVU	Matthew Vester, History
Nolan Holley	Health Sci #1 (10:30 am)	Biochemistry	WVU	Laura Gibson, Microbiology, Immunology & Cell Biology
Justin Huffman	Health Sci #3 (10:30 am)	Chemistry	WVU	Benoit Dreisschaert, Pharmaceutical Sciences
Sydney Hull	Soc & Behav Sci #4 (9:30 am)	Psychology	WVU	Claire St. Peter, Psychology
Sarah Jenness	Health Sci #4 (9:30 am)	Biomedical Engineering	WVU	David Klinke, Chemical & Biomed. Eng.
Matthew Keaton	Engineering #9 (10:30 am)	Computer Science	WVU	Thirimachos Bourlai, Computer Sci. & Electr. Eng
Ineke Knudsen	Human Engag #5 (10:30 am)	Painting	WVU	Patrick Jones, Drawing & Art History
Sara Kuberski	Physical Sci #7 (10:30 am)	Forensic & Inv. Sci. and Chemistry	WVU	Luis Arroyo, Forensics & Inv. Sci.
Mikhaela Lichvar	Biological Sci #7 (10:30 am)	Biochemistry	WVU	Steve Leonard, NIOSH
Matthew Lowery	Biological Sci #8 (9:30 am)	Biochemistry	WVU	Nik Kovinich, Genetics
Anna Loyd	Agric & Env Sci #4 (9:30 am)	Animal and Nutritional Sciences	WVU	Scott Bowdridge, Food Animal Production
Caitlyn Lyons	Human Engag #6 (9:30 am)	Sports Management	WVU	D. Floyd Jones, Sports Management
Jackson Malone	Neuroscience #6 (9:30 am)	Mechanical Engineering	WVU	Sergiy Yakovenko, Exercise Physiology
Natalie Mastroianni	Health Sci #11 (10:30 am)	Biochemistry	WVU	Scott Weed, Biochemistry
Aerianna McClanahan	Human Engag #7 (10:30 am)	English	WVU	Rosemary Hathaway, English
Ethan Mick	Neuroscience #7 (10:30 am)	Biology & Psychology	WVU	Andrew Dacks, Biology
Hunter Moore	Engineering #10 (9:30 am)	Mechanical & Aerospace Eng.	WVU	Christopher Griffin, Mechanical & Aerosp. Eng.
Bradley Newlon	Human Engag #8 (9:30 am)	Economics	WVU	Alexander Lundberg, Economics
Meredith Phillips	Neuroscience #8 (9:30 am)	Biomedical Engineering	WVU	Jessica Allen, Chemical & Biomed. Eng.
Molly Powney	Biological Sci #10 (9:30 am)	Biochemistry	WVU	Blake Mertz, Chemistry
Carlie Ramsayer	Engineering #11 (10:30 am)	Chemical Engineering	WVU	Fernando Lima, Chemical Eng.

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
Jacob Restanio	Engineering #12 (9:30 am)	Computer Engineering	WVU	Gianfranco Doretto, Computer Sci. & Electr. Eng.
Tyler Richards	Agric & Env Sci #6 (9:30 am)	Environmental Geoscience	WVU	Brenden McNeil, Geography
Rilla Samsell	Physical Sci #18 (9:30 am)	Chemistry	WVU	Jessica Hoover, Chemistry
Mathilda Santee	Biological Sci #13 (10:30 am)	Biology	WVU	Craig Barrett, Biology
Alyson Scheibe	Agric & Env Sci #8 (9:30 am)	Wildlife & Fisheries Resources	WVU	Christopher Lituma, Forestry & Natural Resources
Brittany Smith	Health Sci #18 (9:30 am)	Public Health	WVU	Michael Brumage, Occupational Medicine
Noah Spencer	Biological Sci #14 (9:30 am)	Biology	WVU	Rita Rio, Biology
John Tanner	Engineering #13 (10:30 am)	Electrical Engineering	WVU	Parviz Famouri, Computer Sci. & Elect. Eng.
Colter Uscola	Soc & Behav Sci #9 (10:30 am)	Sociology	WVU	Lisa Dilks, Sociology
Corinne Vincent	Biological Sci #17 (10:30 am)	Human Nutrition & Foods	WVU	Melissa Ventura-Marra, Human Nutrition & Foods
Alexandra Wolfe	Engineering #14 (9:30 am)	Mechanical & Aerospace Eng.	WVU	Kostas Sierros, Mechanical & Aerosp. Eng.
Joseph Yeager	Engineering #15 (10:30 am)	Electrical Engineering	WVU	Parviz Famouri, Computer Sci. & Elect. Eng.
Alexandre Ziegelmeier	Physical Sci #19 (10:30 am)	Chemistry	WVU	Gregory Dudley, Chemistry

D. WVU Summer Undergraduate Research Experiences (SURE) Site (Participants funded for participation by other mechanisms.)

Participant	Poster (Judged Time)	Major	Home Institution	Faculty Mentor
[a]Madewa Adeniyi	Engineering #1 (10:30 am)	Biomedical Engineering	WVU	Cerasela-Zoica Dinu, Chemical & Biomed. Eng.
[b]Joseph Ashton	Human Engag #1 (10:30 am)	Computer Eng.	WVU	Melissa Patchan, Learning Sciences & Human Dev.
[a]Diego Cabanillas	Engineering #5 (10:30 am)	Petroleum Natural Gas Engineering	WVU	Kashy Aminian, Petroleum & Natural Gas Eng.
[a]Korina De Jesus	Biological Sci #3 (10:30 am)	Biology	WVU	Vagner Benedito, Plant & Soil Sciences
[c]Olga Hawranick	Human Engag #3 (10:30 am)	Mathematics	WVU	Vicki Sealey, Mathematics
[a]Joshua Hernandez	Engineering #7 (10:30 am)	Computer Science	WVU	Katerina Goseva, Computer Science/Eng.
[d]Quinn Hopen	Health Sci #2 (9:30 am)	Immunology and Medical Micrbiology	WVU	Jennifer Franko, Immunology, Microbiology, & Cell Biology
[d]Wendy Jent	Biological Sci #6 (9:30 am)	Immunology and Medical Microbiology	WVU	Paul Chantler, Exercise Physiology
[a]Kingsly Jonathan	Neuroscience #5 (10:30 am)	Biomedical Engineering	WVU	Shuo Wang, Chemical & Biomed. Eng.
[d]Katherine Lee	Health Sci #8 (9:30 am)	Immunology and Medical Microbiology	WVU	Edwin Wan, Immunology, Microbiology, & Cell Biology
[a]De'Anthony Morris	Agric & Env Sci #5 (10:30 am)	Human Nutrition & Foods	WVU	Jacek Jaczynski, Food Science
[c]Jackson Porter	Physical Sci #13 (10:30 am)	Mathematics	WVU	Kevin Milans, Mathematics
[a]Katelyn Ramsey	Physical Sci #14 (9:30 am)	Biology	WVU	Joohnee Lee, Physics & Astronomy
[e]Lily Schelling	Health Sci #17 (10:30 am)	Immunology and Medical Microbiology	WVU	Salik Hussain, Physiology & Pharmacology
[a]Simeon Spottswood	Agric & Env Sci #9 (10:30 am)	Forest Resources Management	WVU	Matt Kasson, Forest Pathology

[a]Stipends and tuition for eight SURE participants were funded through the NSF Louis Stokes Alliance for Minority Participation (LSAMP) STEM Pathways and Research Alliance Phase III (LSAMP-1826763).
[b]Funded by the WVU College of Education and Human Services
[c]Funded by the WVU Department of Mathematics.
[d]Funded by the WVU Department of Microbiology, Immunology and Cell Biology.
[e]Funded by the WVU Department of Physiology and Pharmacology.

E. Immunology and Medical Microbiology Research Internships (Director: John Barnett)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Claire Kelly	Health Sci #5 (10:30 am)	Immunology & Medical Microbiology	WVU	Fredrick, Damron, Microbiology, Immunology, & Cell Biology
Sophia Kenney	Health Sci #6 (9:30 am)	Immunology & Medical Microbiology	WVU	Candice Brown, Neuroscience & Microbiology, Immunology & Cell Biology
Caleb Kisamore	Health Sci #7 (10:30 am)	Immunology & Medical Microbiology	WVU	Heath Damron, Microbiology, Immunology, & Cell Biology
Aaron Malkowski	Health Sci #9 (10:30 am)	Immunology & Medical Microbiology	WVU	Mariette Barbier, Immunology, Microbiology, & Cell Biology
Nicholas Miller	Health Sci #12 (9:30 am)	Immunology & Medical Microbiology	WVU	Cory Robinson, Microbiology, Immunology, & Cell Biology
Gwendolyn Nurkiewicz	Health Sci #15 (10:30 am)	Immunology & Medical Microbiology	WVU	Jennifer Franko, Microbiology, Immunology & Cell Biology
Travis Rawson	Health Sci #16 (9:30 am)	Immunology & Medical Microbiology	WVU	Cory Robinson, Microbiology, Immunology, & Cell Biology
Alyson Stevens	Health Sci #19 (10:30 am)	Immunology & Medical Microbiology	WVU	Ivan Martinez, Microbiology, Immunology, & Cell Biology

F. Summer Undergraduate Psychology Research Experience (Director: Natalie Shook)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Dandre Conyers	Soc & Behav Sci #2 (9:30 am)	Psychology	Saint Augustine's University	Natalie Shook, Psychology
Brianna Forte	Neuroscience #2 (9:30 am)	Psychology-Neuroscience	University of Mass. Amherst	Cole Vonder Haar, Psychology
Tasia Hawks	Soc & Behav Sci #3 (10:30 am)	Psychology	Chowan University	Natalie Shook, Psychology
Braila Pierce	Soc & Behav Sci #5 (10:30 am)	Pre-medicine Psychology	College of William & Mary	Julie Patrick, Psychology
Bryan Rodriguez	Neuroscience #9 (10:30 am)	Neuroscience	University of Nebraska at Omaha	Cole Vonder Haar, Psychology & Behavioral Neuroscience
Anusha Singh	Soc & Behav Sci #6 (9:30 am)	Psychology and Women's & Gender Studies	WVU	Natalie Shook, Psychology
Malinda Smith	Soc & Behav Sci #7 (10:30 am)	Psychology and Social Work	Barton College	Amy Gentzler, Psychology
Sidney Stover	Soc & Behav Sci #8 (9:30 am)	Psychology/Statistics	Marshall University	Aaron Metzger, Psychology

G. WVU Cancer Institute Summer Undergraduate Research Fellowship Program (Coordinator: Alexey Ivanov)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Alan Mizener	Health Sci #13 (10:30 am)	Molecular Biology	University of Pittsburgh	Brock Lindsay, Orthopaedics
Sloan Nesbit	Health Sci #14 (9:30 am)	Exercise Physiology	WVU	Laura Gibson, Microbiology, Immunology & Cell Biology
Brianna Ritz	Biological Sci #12 (9:30 am)	Human Biology	West Liberty University	Jianhai Du, Ophthalmology
Joshua Taylor	Health Sci #20 (9:30 am)	Biology	WVU	Scott Weed, Biochemistry

H. Undergraduate Water and Energy Systems Scholars (Coordinator: Shawn Grushecky)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Adrian Romero	Agric & Env Sci #7 (10:30 am)	Chemical Eng.	University of Kansas	Shawn Grushecky, Energy Land Management

I. Summer Undergraduate Vision Research Fellowship (Coordinator: Jianhai Du)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Connor Nevin	Biological Sci #9 (10:30 am)	Exercise Physiology	WVU	Saravanan Kolandaivelu, Ophthalmology & Biochemistry

J. Additional Presenters

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Trevor Brison	Engineering #3 (10:30 am)	Mechanical Eng.	WVU	Eduardo Sosa, Mechanical & Aerosp. Eng.
Emily Hummell	Physical Sci #5 (10:30 am)	Biochemistry	WVU	Jessica Hoover, Chemistry
Joseph Lokant	Physical Sci #8 (9:30 am)	Biochemistry	WVU	Jessica Hoover, Chemistry
Mena Mansy	Health Sci #10 (9:30 am)	Biomedical Eng.	WVU	David Klinke, Chemical & Biomed. Eng.
Mariah Murray	Physical Sci #11 (10:30 am)	Chemistry	WVU	Jessica Hoover, Chemistry
Jenny Ng Wu	Physical Sci #12 (9:30 am)	Forensic Chemistry & Chemistry	WVU	Jessica Hoover, Chemistry
Farzaan Salman	Neuroscience #10 (9:30 am)	Biology	WVU	Andrew Dacks, Biology
Sarah Starcovic	Biological Sci #15 (10:30 am)	Chemistry & Biology	Fairmont State U.	Aaron Robart, Biochemistry

IV. Speakers at REU/SURE Events

Speaker	Affiliation	Group(s)	Topic
Barbara Foster	Dept. of Chemistry, WVU	SURE	Laboratory Safety
Matt Stinoski	Biosafety Officer Health Sciences Center	SURE	Biosafety Training
Graduate Students	Various WVU Depts.	REU & SURE	Peer Advice, Networking, Graduate School Recruitment
Holly Fitzgerald	Psychology, WVU	SURE	Diversity Awareness & Implicit Bias
Michelle Richards-Babb	Chemistry & Office of UG Research, WVU	REU & SURE	Ethics, Responsible Conduct of Research, Poster Preparation
Kevin Walden	Office of UG Research, WVU	SURE	Get to Know Bingo, Photos & Getting the Most from Your Mentor
Cari Ferguson	Office of UG Research, WVU	SURE	Getting the Most from Your Mentor
Tim Berge	WVU Library	REU & SURE	Library Research Search Tools
Amy Cyphert	ASPIRE Office, WVU	SURE	Prestigious Scholarships & Fellowships
Leigh Pratt	ASPIRE Office, WVU	SURE	NSF Graduate Research Fellowship
Victoria Sanchez	Pre-Health Office, WVU	SURE	Pre-Health Applications
Jess White, Megan Kruger, Ross Brittain & Bethany Hornbeck	Career Professionals	SURE	Career Mentoring Panel
Robert Baricelli	Career Services, WVU	SURE	Interviewing Skills & Resume Feedback
Shelly Quance & Kevin Walden	WVU Office of Graduate Admissions & Recruiting	SURE	Ice Cream Social & Graduate Recruitment Networking Event
Zachariah Fowler, Sandy Simon, & Steve DiFazio	WVU Arboretum Dir.	SURE	Volunteer Scient. Service Learning
Haley Wahl	WVU Planetarium	REU & SURE	Planetarium Shows
Carrie White & Randolph Quinn	WVU Launch Lab	SURE	Ideation, Modeling & Prototyping

Speaker	Affiliation	Group(s)	Topic
Ryan Claycomb	Honors College, WVU	SURE	Writing Personal Statements
Roark Sizemore	Mobile Food Bank	SURE	Pantry Plus Service Learning
Landon Southerly	Upward Bound Dir.	SURE	Peer Mentoring - Networking
Kas Kasten	HSTA Coord.	SURE	Peer Mentoring - Networking
Abby Sine & Zach Donnellan	First2 Summer Research Immersion	SURE	Peer Mentoring - Networking
Brian Popp	Chemistry, WVU	REU & SURE	ChemDraw Training & NMR Intro
Justin Legleiter	Chemistry, WVU	REU & SURE	Graduate Recruit. & STM/AFM
Stephen Valentine	Chemistry, WVU	REU & SURE	Intro to Mass Spec

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

V. Websites

Need more information?

Honors College: http://www.honors.wvu.edu/
Chemistry REU: http://undergraduateresearch.wvu.edu/reu-site-research-in-chemistry-at-wvu
WVU SURE: https://undergraduateresearch.wvu.edu/research-opportunities/wvu-opportunities/summer-undergraduate-research-experience-sure
Community Engagement in Science Through Art (CESTA): http://www.cestaprogram.com/
WVU Cancer Institute Summer Undergraduate Research Fellowship Program: http://wvucancer.org/education/undergraduate/
Office of Undergraduate Research: http://undergraduateresearch.wvu.edu/

VI. Acknowledgements

A. Personnel

WVU SURE
Michelle Richards-Babb, Director/Educ. Coord.
Kacee Caster, Teaching Assistant
Grace Childs, Teaching Assistant
Kevin Walden, Program Coordinator

Symposium Booklet
Michelle Richards-Babb
Kevin Walden
Kayla Tokar

B. Financial Support

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

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

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

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

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

Undergraduate Water and Energy Systems Scholars (Director: Shawn Grushecky) Funded under the NSF EPSCoR project "Improving Water Management, Treatment and Recovery in Oil and Gas Production" – a joint project between the University of Kansas and WVU.

Louis Stokes STEM Pathways and Research Alliance: KY-WV LSAMP (WV PI: David Miller) Stipends and tuition for eight SURE participants were funded through the NSF Louis Stokes Alliance for Minority Participation (LSAMP) STEM Pathways and Research Alliance Phase III (LSAMP-1826763).

Summer Undergraduate Psychology Research Experience (PI: Natalie Shook) Funded by the American Psychological Association's Summer Undergraduate Psychology Research Experience program with support from WVU's Office of the Provost and Department of Psychology.

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

Agricultural & Environmental Sciences Index:

Poster 1: Method development for the quantification of flavonoids in ramps (Allium tricoccum). **Sara DeJarnett**, Wijdan Dabeek, and Melissa Ventura-Marra.

Poster 2: Stability/ feeding efficacy of phytase products in broiler diets based on performance. **Kendal DeMarco**, Kenzie George, Mark Jackson and Joe Moritz.

Poster 3: Factors Controlling Rock City Formation and Their Potential Hazard to Infrastructure in WV. **Christopher S. D'Emidio**, J. Steven. Kite, Shannon M. Maynard, and Matthew L. Bell.

Poster 4: Chronically inflamed: the reason for poor immune response in Suffolk sheep. **Anna Loyd** and Scott Bowdridge.

Poster 5: Does This Smell Bad: Detecting Volatile Organic Compounds (VOCs) of Pathogenic Bacteria. **De'Anthony Morris**, Jessica Lemley and Jacek Jaczynski.

Poster 6: Topographic effects on Tree Size and Species in Central WV. **Tyler Richards**, Brenden McNeil, Brittany Casey, Ben Mountain, Danielle Canning, and Molly Sherlock.

Poster 7: Microbial Growth of Hydrocarbon Degrading Organisms in Produced Water. **Adrian Romero**, Shawn T Grushecky, Zachary Freedman and Edward F Peltier.

Poster 8: An Invasive Species' Silver Lining: Forest Bird Community Before Emerald Ash Borer Invasion. **Alyson M. Scheibe**, Daniel P. Roche, and Christopher M. Lituma.

Poster 9: Do arbuscular mycorrhizal fungi interact with fertilizer to modify terpene profiles in hemp?. **Simeon Spottswood**, Michael Gutensohn, Greg R. Boyce, Louis M. McDonald, Bill Wheeler, and Matt T. Kasson.

Biological Sciences Index:

Engineering Index:

Poster 1: User-controlled strategies for effective enzyme immobilization. **Madewa V. Adeniyi**, Jordan S. Chapman, Huy Pham and Cerasela Zoica Dinu.

Poster 2: Low-Power Gait Analyzer to Aid Parkinson's Disease Diagnosis. **Swagat Bhattacharyya**, Steven Andryzcik, Alex Dilello, Jared Baker, and David Graham.

Poster 3: Development of Digital Models for Manufacturing of Surrogate Hands for Impact Tests. **Trevor Brison1**, Faisal Alessa2, Marta M. Moure3, Eduardo M. Sosa1.

Poster 4: 3D Printable Graphene-TiO2 Foam Composites for Space Applications. **John Burke**, Harrison Loh, Iole Pecora, and Konstantinos Sierros.

Poster 5: Measuring Gas Adsorption Characteristics of Marcellus Shale with Gas Adsorption Isotherm System. **Diego M. Cabanillas**, Yahia Mustafa, and Kashy Aminian.

Poster 6: Human-Swarm Interaction Software Platform. **Casey Edmonds-Estes**, Yu Gu, Jason Gross, Guilherme Pereira, Jeongwoo Seo, Henry Vos, Nathan Hewitt, Aleks Hatfield, Henry Gunner, Alex Collins, Julietta Maffeo, Lunet Yifru, Neel Dhanaraj, Rachel Jarmen, Tucker Johnson, Ben Buzzo, and Derek Ro.

Poster 7: Analysis of Vulnerabilities in Ubuntu Operating System. **Joshua Hernandez**, Mohammad Jamil Ahmad, and Katerina Goseva-Popstojanova.

Poster 8: Swarmaneer: A System Design of Human-Robotic Swarm Interactive Platform. **Rachel Jarman,** Yu Gu, Jason Gross, GP, Neel Dhanaraj, Lunet Yifru, Tucker Johnson, Julietta Maffeo, Henry Gunner, Nathan Hewitt, Henry Vos, Jeongwoo Seo, Casey Edmonds-Estes, Alexandra Collins, Alexandra Hatfield, Ben Buzzo and Derek Ross.

Poster 9: Classification of Different Mediums of Audio Utilizing Machine Learning Techniques. **Matthew Keaton** and Thirimachos Bourlai.

Poster 10: Optimization of Vicon Motion Capture Marker Placements Using Computational Symmetry. **Hunter T. Moore** , and Christopher D. Griffin.

Poster 11: Quantifying United Nations Sustainable Development Goals Using GREENSCOPE Indicators. **Carlie B. Ramsayer**, Selorme Agbleze, Gerardo J. Ruiz-Mercado, and Fernando V. Lima.

Poster 12: Multi-Source Domain Adaptive Segmentation of Microscopy Images. **Jacob Restanio**, Liam Mcgoldrick, and Gianfranco Doretto.

Poster 13: Single-cycle starter for gas-powered oscillating generator. **John T. Tanner**, Parviz Famouri, and Jayaram Subramanian.

Poster 14: PDMS-Silver Composite Sensors for Strain Monitoring in Human Joints. **Alexandra B. Wolfe** , Harrison Loh, and Kostas Sierros.

Poster 15: Designing a Steady State Starter for a Natural Gas-Powered Engine. **Joseph Yeager** , Jayaram Subramanian, and Parviz Famouri.

Health Sciences Index:

Poster 1: Evaluation of NL-1 and TT01001 in drug resistant B-cell acute lymphoblastic leukemia. **Nolan R. Holley** , Debbie Piktel, Werner J. Geldenhuys, Karen H. Martin, Stephanie L. Rellick and Laura F. Gibson.

Poster 2: The influence of short chain fatty acids on intestinal epithelial cell activity. **Quinn Hopen** , Allison Brichacek, Candice Brown, Jennifer Franko, and Rosana Schafer.

Poster 3: Development of in vivo alkaline phosphatase measurement using electron paramagnetic resonance imaging. **Justin Huffman** , Martin Poncelet, and Benoit Driesschaert.

Poster 4: Fluorescently labeled antibodies map tumor environment to enhance cancer patient survival. **Sarah L Jenness**, Thomas Ogershok, Wentao Deng, Naira Margaryan, and David J Klinke.

Poster 5: Investigating fetal bovine serum effects on Bordetella pertussis gene expression and growth. **Claire O. Kelly**, Mary A. Wolf, Ksheeraja A. Sriram, Caleb A. Kisamore, Jesse M. Hall, and F.H. Damron.

Poster 6: Chronic intestinal dysbiosis in a mouse model of Alzheimer's disease. **Sophia M. Kenney**, Allison L. Brichacek, Catheryne A. Gambill, and Candice M. Brown.

Poster 7: Developing novel biomarker-based in vitro pertussis toxin neutralization assay to evaluate protective antibodies. **Caleb Kisamore** , Dylan Boehm, M. Allison Wolf, William Witt, and F. Heath Damron.

Poster 8: Visualization of innate immune cell pathogenicity post ischemic stroke using histopathological techniques. **Katherine S. Lee** , Shokofeh Rahimpour, Wen Zheng and Edwin C.K. Wan.

Poster 9: Determining the Functions of Monoclonal Antibodies against Pseudomonas aeruginosa. **Aaron C. Malkowski** , Alexander M. Horspool, Scott L. Breslow, Emel Sen-Kilic, Catherine Blackwood, F. Heath Damron, and Mariette Barbier.

Poster 10: The role of WISP1 gene in Zebrafish (Danio rerio). **Mena Mansy**, Cody Lemley, Catherine Vanmeter, David Klinke, and Danielle Norman.

Poster 11: Evaluation of MMP9 Inhibitor Andecaliximab as Inhibitor of HNSCC. **Natalie M. Mastroianni**, Jessica L. Allen, Steven M. Markwell, Brenen W. Papenberg, Robert E. Hickey, Joshua L. Taylor, and Scott A. Weed.

Poster 12: The Influence of Obesity on the Risk and Severity of Enteric Bacterial Infection**. Nicholas Miller** , Anne Groover, Michelle Witt, and Cory Robinson.

Poster 13: Fabrication and Biodistribution of IL-12 Loaded PLGA Nanoparticles for Immunotherapeutic Treatment of Osteosarcoma. **Alan Mizener**, Brock Lindsey, Justin Markel, and Ryan Lacinski.

Poster 14: Characterization of Drug Resistant Cell Lines of B-cell Acute Lymphoblastic Leukemia. **Sloan Nesbit,** Debra Piktel, and Laura F Gibson.

Poster 15: Sex Chromosomes and Gut Microbiome Metabolites Interact to Modulate Antibody Responses. **Gwendolyn Nurkiewicz**, Andrea Pettit, Karagan Mulhall, Quinn Hopen, Rosana Schafer, and Jennifer Franko.

Poster 16: The Chemotactic Potential of Myeloid Derived Suppressor Cells during Murine Neonatal Sepsis**. Travis Rawson** , Jordan Vance , Shelby Bradford, Nick Miller , Michelle Witt, and Cory Robinson.

Poster 17: Impact of Ozone and Ultrafine Carbon Black Co-Exposure on the Development of Asthma. **Lily Schelling**, Nairrita Majumder, Sherry Xie, and Salik Hussain.

Poster 18: Making a Case for Treating Substance Use Disorder: A Family Disease. **Brittany T. Smith** , Michael R. Brumage, Keith Zullig, and Elizabeth Claydon.

Poster 19: Gender Differences in Immune Checkpoint Expression in Lung Cancer Cell Lines After Radiotherapy. **Alyson Stevens**, Tayvia Brownmiller, Brandon Harvey, Erik Bey and Ivan Martinez.**:**

Poster 20: Towards the identification of factors responsible for cortactin-independent tumor cell invasion. **Joshua L. Taylor**, River A. Hames, Brenen W. Papenberg, Jessica L. Allen, Robert E. Hickey, Steven M. Markwell, and Scott A. Weed.

Human Engagement Index:

Poster 1: Novice and Expert Differences in Reviewing Student Work. **Joseph M. Ashton** and Melissa M. Patchan.

Poster 2: Asylum Law: A Comparative Policy Analysis Between the United States, France, and Germany. **Sara Bravo-Peterec**.

Poster 3: Active Learning: Why is this effective teaching technique not used more often? **Olga Hawranick**, Vicki Sealey, Nicole Engelke, Lori Ogden, and Keith Gallagher.

Poster 4: Between two worlds: power, politics, and noblewomen in early modern Europe. **Jessica Hogbin** and Matthew Vester1.

Poster 5: Construction of Personal Identity Within Postmodern Society. **Ineke Knudsen**.

Poster 6: Camp FeWi: addressing the decline in female sport participation. **Dennis Flloyd Jones**, Caitlyn Lyons, and Ashley M. Coker-Cranney.

Poster 7: Combatting negative depictions of Appalachia by analyzing diversity and inclusivity within the region. **Aerianna B. McClanahan** and Rosemary Hathaway.

Poster 8: Feedback mechanisms on alphabay market. **Bradley Newlon**.

Neuroscience Index:

Physical Sciences Index:

Poster 18: Development of a Copper-Catalyzed Decarboxylative Heck Reaction. **Rilla M. Samsell** , Keven Medina , Jiaqi Liu, and Jessica Hoover.

Poster 19: Investigating the Selective Microwave Heating on the 1,2-Meisenheimer Rearrangement and Sakurai Reaction. **Alexandre Ziegelmeier** , Michael Frasso, and Gregory Dudley.

Social & Behavioral Sciences Index:

Poster 1: An evaluation of free-listing as a method to identify cultural perceptions of cancer. **Grace Belknap**, Susanna Donaldson, and Ann M. Morris.

Poster 2: Mindful and Happy with Life: The Roles of Self-esteem and Perceived Stress. **Dandre Conyers**, Audrey Weiss, Jerin Lee, Cameron Ford, and Natalie J. Shook.

Poster 3: Spirituality Linked to Better Psychological Well-Being in African Americans. **Tasia Hawks**, Holly Fitzgerald, Patricia D. Hopkins, and Natalie J. Shook.

Poster 4: Omitting Reinforcers Decreases the Efficacy of Noncontingent Reinforcement. **Sydney Hull** , Stephanie H. Jones and Claire C. St. Peter.

Poster 5: How Awesome Is Your Life? **Braila Pierce** and Julie Patrick.

Poster 6: Examining the Link Between Mindfulness and Prejudice: The Role of Social Dominance Orientation. **Anusha Singh** , Audrey Weiss, Holly Fitzgerald, and Natalie Shook.

Poster 7: Associations between Parental Attachment, Delaying Gratification, and Substance Use in Adolescents. **Malinda Smith** , Amy Gentzler, Tyia Wilson, and Jeffrey Hughes.

Poster 8: Longitudinal Patterns of Teacher, Parent, and Peer Social Support During Adolescence. **Sidney Stover** , Sloane Glover and Aaron Metzger.

Poster 9: From Status and Trust to the Allocation of Positive and Negative Rewards. **Colter J. Uscola** , Lisa M. Dilks, and Tucker S. McGrimmon.

Agricultural & Environmental Sciences Poster 1:

Method development for the quantification of flavonoids in ramps (Allium tricoccum)

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Ramps (Allium tricoccum) are perennial plants grown in the forests in the eastern United States. They contain the flavonoids, quercetin and kaempferol, which have been associated with reducing blood pressure. However, little is known about the quantity of the potentially bioactive compounds in ramps. Quantifying the major flavonoids in the plant is important to determine the dosage of ramps that may be necessary to lower blood pressure. This study aims to develop a quantification method. Two major factors were examined, starting material (plant tissue or extract), and acid concentration (1-6 M HCl). Compounds were hydrolyzed in a hot water bath and detected using Ultra High-Performance Liquid Chromatography. Flavonoids were detected after the hydrolysis of the extract but not plant tissues. The highest quercetin and kaempferol levels were detected using 3 and 4 M HCl, respectively. Optimal quercetin and kaempferol hydrolysis method were achieved using plant extract and 3, 4 M HCl, respectively. This method will be used to quantify flavonoids in ramps to determine the effective dosage.

Agricultural & Environmental Sciences Poster 2:

Stability/ feeding efficacy of phytase products in broiler diets based on performance

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Phytase products in broiler feed will affect broiler overall growth and health. Broilers are the chickens that are used for meat for public consumption. The addition of phytase enzymes in the broilers feed will help improve the quality of meat for consumers. The objectives of the study were to determine the activity of three phytase products after pelleting (the method where the feed is made into pellets for easier broiler consumption) using high conditioning temperatures. Dietary treatments included a positive control (PC), negative control (NC), and three additional diets containing different phytase enzymes (Optiphos 6000, Uncoated Phytase, Coated Phytase) added to the NC diet. Phytase treatments were conditioned at 79.4, 85, and 90.6ËšC for thirty seconds. PC and NC diets were conditioned at 85ËšC for thirty seconds. Samples were analyzed for crude protein, total and phytate phosphorus, calcium, and phytase activity. Pellet Durability and Modified Pellet Durability were measured on the pelleted samples. Data indicated greater pellet durability and lower phytase activity with increasing steam conditioning temperature and with the Uncoated Phytase Enzyme.

Agricultural & Environmental Sciences Poster 3:

Factors Controlling Rock City Formation and Their Potential Hazard to Infrastructure in WV

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A type of landslide known as lateral spread can form features known as rock cities that are made of resistant sandstone units, typically underlain by weaker mud-rocks. These are generally highly dissected landforms that form tall cliffs and huge blocks, separated by narrow passages. Assessing the factors controlling lateral spreads will help anticipate hazards when developing infrastructure. Using 1-meter LiDAR-derived DEMs, nearly 200 lateral spreads were mapped throughout part of West Virginia. Each feature was identified by its geology and planar geometry, digitized as polygons, and measured to calculate dimensions, elevation, and surface area. Laterally spreading blocks pose a potential threat if the displaced rock falls farther down the hillside. To assess hazard susceptibility, slope measurements were derived from the elevation change and distance from the head scarp to the lower end of the digitized rock city, and another set of measurements from the lower extent of the rock city to a point 100 meters farther down-slope. Hillsides with convex slopes of 40% or more are predicted to be the largest threat to man-made structures.

Agricultural & Environmental Sciences Poster 4:

Chronically inflamed: the reason for poor immune response in Suffolk sheep

Anna Loyd and Scott Bowdridge
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Suffolk (SUF) sheep have greater resting circulating concentration of nitric oxide (NO) and a less robust immune response to parasitic infections than St. Croix (STC) sheep. Therefore, production of NO without an infectious agent present may predicate poor immune response. The objective of this study was to determine differences in NO production between SUF and STC sheep after challenge with lipopolysaccharide (LPS). Yearling SUF sheep (5 females, 4 males) and STC yearlings (5 females, 5 males) were intravenously dosed with LPS (2.5Âµg/kg). Blood samples and temperature was taken hourly for 10 hr after LPS injection. Temperature in STC peaked sharply and returned to baseline, while SUF became elevated and was maintained. No breed difference in NO was observed and was likely due to sequestration of NO in mucosal tissues. Behavioral effects of LPS administration were observed more frequently in SUF vs. STC, indicating support of the notion of greater immunocompetence in STC sheep. Taken together, these data provide information that may influence management of disease within sheep herds and genetic selection of future herds.

Agricultural & Environmental Sciences Poster 5:

Does This Smell Bad: Detecting Volatile Organic Compounds (VOCs) of Pathogenic Bacteria

De'Anthony Morris,* Jessica Lemley* and Jacek Jaczynski*
Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV

Annually, pathogenic bacteria cause millions of cases of foodborne illness disrupting economic production through sickness, hospitalization and in some cases death. Therefore, the purpose of this study is to distinguish pathogenic bacteria, specifically, *Escherichia coli* O157:H7 and *Salmonella Enteritidis* ATCC 13076 through their volatile organic compounds (VOCs): chemicals detected by olfaction emitted from the environment. The project is intended to provide a blueprint for food companies to rapidly identify these bacteria that may enter the consumer food supply. Before moving forward with publishable experiments, preliminary tests are currently running to determine an appropriate length of time for VOC collection to measure all phases of bacterial life. The methodology uses a closed-loop headspace system to capture VOCs via carbon fibers. Samples are then analyzed by an ultra-sensitive gas chromatography mass spectrometer (GC-MS) that identifies VOCs through molecular weight and compares them to a database with chemicals of similar structure. Looking forward, Escherichia coli O157:H7 and Salmonella Enteritidis bacteria will be grown in various media including egg and ground beef at 37 degree Celsius.

Agricultural & Environmental Sciences Poster 6:

Topographic effects on Tree Size and Species in Central WV

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Different species of trees have adaptations that can help them be more successful in certain topographic environments. Testing the relationship among topography and species can help refine our ability to understand the roles forests play in sequestering atmospheric CO2 and mitigating climate change. To test this relationship, we mapped over 6200 trees within a gridded plot in the Summit Bechtel Scout Reserve located near Oak Hill, WV. For each tree, we identified its' species, measured its' size (i.e. diameter at breast height), and mapped the bearing and distance to each tree from a surveyed corner of the plot grid. These measurements were used to create a digital map of the forest tree species composition and tree sizes, a Geographic Information System was used to test how tree size and tree species varied with topography. We also used a digital elevation and a water balance model to identify how topography creates wet and dry portions of the landscape. This helps to refine predictions of forest growth and atmospheric CO2 sequestration under a changed climate.

Agricultural & Environmental Sciences Poster 7:

Microbial Growth of Hydrocarbon Degrading Organisms in Produced Water

[1]Adrian Romero, [2]Shawn T Grushecky, [3]Zachary Freedman and [4]Edward F Peltier

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Produced water is brought to the surface along with oil or gas. Currently it's the biggest hazardous byproduct from natural gas production and either discharged into above ground storage facilities or re-introduced through hydraulic fracturing. Spillage of produced water can have deleterious effects on surface soils and water which is a growing public concern. Bioremediation has become a major method for restoration of hydrocarbon-polluted environments making use of natural biodegradation of hydrocarbons by microbial communities able to utilize such as their carbon sources for growth. In this research, microbial communities were harvested from soil samples surrounding a conventional petroleum well. Two methods of microbial growth were tested in this research, growth with produced water and growth with crude oil as the carbon source. We expect growth in both sources to vary depending on the carbon source and the distance from the petroleum well. Results from this research could give a more sustainable alternative for hydrocarbon removal in water or contaminated soils and provide an attractive solution for water treatment within the industry.

Agricultural & Environmental Sciences Poster 8:

An Invasive Species' Silver Lining: Forest Bird Community Before Emerald Ash Borer Invasion

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Emerald Ash Borer (EAB) is a beetle-like insect that lays eggs in the grooves of Ash (Fraxinus spp.) tree bark. Once hatched, EAB larvae feed beneath the bark and stop the flow of water and nutrients, causing the tree to starve to death. The imminent loss of Ash trees from eastern deciduous forest ecosystems will change the richness and abundance of this forest bird community in species-specific ways. The Cerulean Warbler, a continually declining species of Conservation Concern, is of interest because it prefers a mature deciduous forest with canopy gaps. We hypothesize that canopy gaps created because of Ash mortality caused by EAB will positively affect Cerulean Warbler occurrence and abundance as improved habitat. From May-June 2019, we conducted avian point counts to document the occurrence and abundance of avian species on a private property in Albemarle County, VA. Additionally, we collected vegetation data to model habitat relationships to the bird community prior to EAB invasion. Future surveys will be conducted to determine effects on the bird community as EAB changes the forest composition.

Agricultural & Environmental Sciences Poster 9:

Do arbuscular mycorrhizal fungi interact with fertilizer to modify terpene profiles in hemp?

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The 2018 Farm Bill ushered in a dramatic shift in policy regarding the planting and utilization of hemp (Cannabis sativa L.) as a viable agricultural crop. Historically cultivated for seeds and fiber, Cannabis is now also being grown for a variety of medicinal compounds, specifically cannabinoids and terpenes. In response to growing economic interest as well as a lack of research due to legal restrictions, this research was conducted to understand how arbuscular mycorrhizal fungi (AMF) and fertilizer interact to modify terpene profiles in hemp. Using solvent extraction and Gas Chromatography-Mass Spectrometry (GC-MS), hemp leaf and flower samples were analyzed to quantify relative abundances of these secondary metabolites. Treatments of hemp plants were divided by the presence or absence of AMF and fertilizer. In Experiment-1, results show more variability in monoterpene production across treatments compared to sesquiterpenes. Most notably, Î²-pinene was reduced by the presence of AMF without fertilizer. Although the results of Experiment-2 are pending, these data should help confirm whether these reductions in monoterpenes are consistent in their association with AMF.

Biological Sciences Poster 1:

Characterization of Putative Glyceollin Synthase Genes from Glycine max

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Glyceollin Synthases (GLS) are cyclase enzymes and belong to a class of enzyme that have not yet been characterized. Glyceollins are valuable in medicine and agriculture, with antiestrogenic properties useful in breast cancer treatment and antimicrobial activities for protecting crops. GLS activities catalyze the final steps of glyceollin biosynthesis in Glycine max (soybean). To search for genes that may encode GLS enzymes, transcriptome profiling was employed to identify what genes were upregulated and downregulated with glyceollin biosynthesis. The GLS1a and GLS1b genes were identified. GLS1b showed significantly different levels of glyceollin biosynthesis when silenced compared to control samples. To determine subcellular localization, the GLS1b gene was translationally fused with green fluorescent protein, was transformed into soybean hairy roots and observed by confocal microscopy. GLS was observed to be localized in endosomes and the endoplasmic reticulum, the reported locations of GLS activity. Transformed yeast expressing the GLS1b gene was exposed to a glyceollinidin-containing mixture isolated from GLS1b-silenced roots. Experiments must be repeated with vesicles isolated from GLS1b yeast, since no activity was observed.

Biological Sciences Poster 2:

Rapid DNA Profiling

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Rapid DNA analysis, the ability for an untrained individual to produce a full forensic DNA profile in one hour or less using a single suitcase-sized instrument, has been made a reality in recent years. Rapid DNA analysis is being used in law enforcement applications as well as familial testing and border security. The overall goal of the research being conducted in Dr. Dawson's Rapid DNA Analysis Lab is to expand the sample types that can be used by Rapid DNA systems using signal processing techniques often employed in the field of biometrics. The goal of the research I am conducting is to evaluate the performance of the RapidHIT-200 system when using DNA samples collected by a new forensic DNA collection device, the M-VAC system. This research will expand the application space of Rapid DNA systems, allowing them to be employed in a wider range of operational scenarios within DOJ, DHS, and DOD.

Biological Sciences Poster 3:

CRISPR/Cas9 gene editing of nodule-specific genes in the model legume Medicago truncatula

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2) Plant Biotechnology, Federal University of Lavras, Brazil

The global population will reach around 10 billion people by mid-2050 and food supply must double to meet future demand. Nitrogen is one of the most expensive consumables in agriculture and legumes are a natural and sustainable source of N fertilization through symbiotic N fixation (SNF) with rhizobia. Medicago truncatula is a model used to understand the symbiosis between plants and rhizobial bacteria. We are using a gene editing approach to knockout six genes expressed exclusively in a specialized organ called the nodule, where SNF happens. Four of these genes are membrane transporters and two are transcription factors putatively involved in nutritional exchanges between the plant nodule cells and the endosymbiotic bacteria during nodule development or active SNF. We hypothesize that these genes are essential for SNF to occur; therefore the loss of gene functions will each lead to SNF disruption. By understanding the function of essential genes during SNF we will enable breeding of plants with improved N nutrition to reach higher crop yields in a more sustainable fashion.

Biological Sciences Poster 4:

Filament Formation of the Liver Isoform of Phosphofructokinase-1 Increases Enzyme Activity

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Diseases such as cancer and diabetes result from altered glucose metabolism. Phosphofructokinase-1 (PFK-1) plays a crucial role in glycolysis by catalyzing the step committing glucose to breakdown. We previously showed that the liver isoform of PFK-1 (PFKL) forms filaments but the function of these filaments is unknown. We sought to develop a filament incompetent PFKL (FI-PFKL) based on our electron microscopy 3D reconstruction to determine the function of filament formation. FI-PFKL and wild type were expressed and purified using a baculoviral expression system. The size of their particles was determined by dynamic light scattering and transmission electron microscopy, confirming FI-PFKL was unable to form filaments. In contrast to wild type PFKL, FI-PFKL was predominantly tetrameric. In vitro kinase assays were performed, concluding that FI-PFKL had a lower maximum activity and affinity for sugar compared to the wildtype but similar inhibition by ATP, suggesting allosteric regulation was maintained. Our findings suggest that the formation of filaments increases enzyme activity and affinity for fructose 6-phosphate, leading to a better understanding of an important glycolytic enzyme.

Biological Sciences Poster 5:

Activation of phosphofructokinase-1, the "gatekeeper" of glycolysis

Morgan J. Glass* and Bradley A. Webb
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Glucose metabolism, which is dysregulated in disease, is regulated by the “gatekeeper” enzyme phosphofructokinase-1 (PFK-1). The platelet isoform of PFK-1 (PFKP) has been previously characterized to be activated by fructose-2,6-bisphosphate (F2,6bP) but not fructose-1,6-bisphosphate (F1,6bP), unlike other isoforms that are activated by both sugars. However, the molecular mechanism of this differential activation by PFKP is unknown. To investigate this, we first needed to confirm that F1,6bP was unable to activate PFKP using *in vitro* kinase activity assays. Contrary to previous literature, µM concentrations of F1,6bP were found to activate PFKP. To produce F2,6bP for use in comparative studies, a bacterial expression system was used to generate recombinant phosphofructokinase-2 that will phosphorylate fructose-6-phophate to F2,6bP *in vitro*. Next steps include determination of crystal structures of PFKP bound to either F1,6bP or F2,6bP. Testing for optimal crystallization conditions showed crystals diffracting to a resolution sufficient for structural studies. These results provide molecular insight into the regulation of PFK-1 and its potential role in the dysregulated glucose metabolism in diseases such as cancer, diabetes, and neurological disease.

Biological Sciences Poster 6:

The role of chronic stress on cerebrovascular function.

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Chronic stress has been linked to cerebrovascular diseases such as strokes and Alzheimer's disease. Chronic stress in rats reduces cerebrovascular function, attributed to an increase of oxidative stress. However, the source of oxidative stress hasn't been identified. For 8 weeks, mice underwent unpredictable chronic mild stress (UCMS) with and without febuxostat, a xanthine oxidase inhibitor. At 24 weeks of age, mice were euthanized and vascular function was analyzed using the middle cerebral arteries (MCA) via a pressure myography chamber. Flow cytometry and cytokine levels were assessed on brain tissue to support the hypothesis. Compared to control mice, MCA dilation to a vasodilator (acetylcholine) decreased in UCMS mice. Additionally, TNFÎ±, a proinflammatory cytokine, increased 1000-fold supported by a decrease in anti-inflammatory phenotype of macrophages within the brain of UCMS vs. control mice. Chronic febuxostat treatment with UCMS prevented the impaired MCA dilation, and limited the change in the immunological profile of the brain. This suggests that xanthine oxidase plays a key role in the stress induced cerebrovascular dysfunction which may be driven by an immune response.

Biological Sciences Poster 7:

Toxicity of Mild and Stainless Steel Welding Fumes

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Toxicology research is important as it promotes a healthy atmosphere for the people and environment. Toxicology is able to provide an in depth look of how chemicals and particles interact with the body. Welding fume particles are known to contain toxic components and properly researching the effects of these components can help create a safer occupational environment. The mouse monocyte cell line RAW 264.7 was cultured. Once plated the cells were treated with stainless (SS) and mild steel (MS) welding fumes as well as chromium and PBS as controls. Assays were run including viability, intracellular reactive oxygen species (ROS), membrane damage, and cell signaling. Results demonstrated that the SS welding fumes caused significant cell death, cell membrane damage, and intracellular ROS, while MS welding fumes were significant only at the highest treatment. Results also showed high chromium levels in SS welding fumes which are thought to be responsible for their more toxic effects on cells. Our results indicate that elemental components of welding material can have a significant effect on toxicity.

Biological Sciences Poster 8:

Glyceollin I Attenuates Hypoxia-Induced Chemoresistance in Lung and Breast Cancer Cell Lines

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Hypoxic conditions are common in tumors due to inadequate oxygen supply caused by limited vasculature to the tumor mass. Under hypoxic conditions, certain cancer types develop resistance to many chemotherapies. A549 lung and MDA-MB-231-triple negative (ER-, PgR-, HER-) breast cancer cell lines are known to experience resistance to the anticancer drug doxorubicin under hypoxic conditions. However, a soybean derived phytoalexin, glyceollin I (GlyI), can resensitize the cells to the chemotherapy drug. The mechanism behind the resensitization to chemotherapy is not fully understood. Some studies suggest that GlyI inhibits the HIF-1 pathway. We saw the antiproliferative effect of GlyI was present in both cell lines under normoxia when HIF-1Î± expression is low. The transcript levels of HIF-1Î± targets were also unchanged upon treatment with GlyI under hypoxia. This suggests a different pathway is involved. Other possible mechanisms include the Nrf2/HO-1 pathway, CLIC4 upregulation, or NME1 upregulation, along with many other potential mechanisms. Through proteomic studies of cells cultured in hypoxia and treated with GlyI, we could identify a potential mechanism of the resensitization effect of GlyI.

Biological Sciences Poster 9:

Identification of novel protein-interacting partners for photoreceptor specific protein PRCD

Connor Nevin, Gabrielle Hamner and Saravanan Kolandaivelu
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Progressive rod-cone degeneration (PRCD) is a protein localized to the outer segment of the photoreceptor cell with unknown function. Mutations in the gene coding for PRCD are associated with Retinitis Pigmentosa (RP), a group of genetic disorders that lead to the breakdown and loss of cells in the retina. Previous studies have shown that PRCD interacts with rhodopsin, the visual pigment essential to initiation of phototransduction in vertebrate photoreceptors. To further characterize the protein-protein interactome of PRCD, we employed co-immunoprecipitation of endogenous PRCD from murine retina followed by mass spectrometry and subsequently identified multiple novel PRCD-interacting proteins. Here we report the association of PRCD with the retinol-binding protein transthyretin, among others. Analysis of mass spectrometry results revealed that contrary to previously published findings, rhodopsin was not identified as an interacting protein in this experiment. These results serve as preliminary data for continued characterization of PRCD's protein-interacting partners and its unknown role in vision.

Biological Sciences Poster 10:

pH (Low) Insertion Peptide: Thermodynamic Cycle Illustrates Binding Properties in POPC Bilayer

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In recent years, pH (low) insertion peptide (pHLIP) has become forefront in leading biomedical research due to its applications for disease imaging and transfer of therapeutic cargo across cellular membrane surfaces. Due to its pH-selective behavior, pHLIP specifically targets acidic environments, such as those found in cancerous tissues, forming a transmembrane helix in the bilayer, and has thus stimulated scientific interest in the peptide's tethering functionality and possible applications in the medical field. However, as of now, without much information in respect to pHLIP's unique binding properties further investigation is needed before the peptide can be practically applied as a diagnostic tool and feasible treatment plan for damaged cells. The purpose of the study is to garner more knowledge regarding the thermodynamic and binding energies of pHLIP; atomistic molecular dynamics simulations were utilized to visualize the structure-binding relationship and interaction between the peptide and 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC) bilayer surface. Significantly, the results provide insight into interactions between the peptide and the POPC bilayer and help uncover the relative free energies of the thermodynamic cycle of pHLIP.

Biological Sciences Poster 11:

Nitrogen-Containing Aromatic Rings Underpin Productive Ligand-Receptor Complexes of Platelet-Activating Factor Receptor (PAFR)

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G-protein coupled receptors (GPCRs) are membrane proteins vital for cell signaling processes that also represent almost half of all pharmaceutical targets. Platelet-activating-factor receptor (PAFR) is a GPCR that is a potential target for drug development to treat asthma, chronic obstructive pulmonary disease (COPD), cystic fibrosis, and cancer. While numerous ligands of PAFR have been developed, the structure-function relationship of PAFR activation and inhibition is unclear. Understanding this relationship will allow for development of more effective agonists and antagonists of PAFR. AutoDock Vina was used to dock agonists and antagonists in both active and inactive conformations of PAFR to determine shared and unique characteristics of ligand-receptor complexes. We obtained docking energies between -6.14 and -12.33 kcal/mol. It was found that ABT-491, synthesized from an indole ring scaffold, and Y-24180, a thienotriazolodiazepine, had the lowest binding energies of the ligands in the active and inactive PAFR conformations. These results lead to the conclusion that nitrogens in aromatic rings within the ligand have a strong contribution to forming stable ligand-receptor complexes in PAFR.

Biological Sciences Poster 12:

Tissue Specific Nitrogen Metabolism by Retina and Retinal Pigmented Epithelium

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Nitrogen plays a crucial role in the synthesis of amino acids and neurotransmitters in retina and retinal pigmented epithelial (RPE). To investigate nitrogen metabolism in these cells, retinas and RPE were isolated from mice and incubated with various nitrogen containing stable isotope tracers. To test nitrogen metabolism in vivo, 15NH4Cl was administered by intraperitoneal injection and blood, retina, RPE, liver, and brain were collected for analysis at different times post injection. In vitro 15NH4Cl and glutamine with a labelled amide group primarily showed the production of glutamine in both retina and RPE. We found that alanine was used by RPE to produce new nonessential amino acids especially aspartate, but it was not used by the retinas. In fact, other nitrogen labelled metabolites in the retina were used to produce alanine. Leucine showed a similar results. The in vivo 15NH4Cl injections produced similar results as the in vitro experiment. Overall, these results demonstrate that retina relies on the nitrogen donors from glutamate and aspartate while RPE could use different nitrogen sources for amino acid synthesis.

Biological Sciences Poster 13:

Integrative species delimitation in Californian striped coralroot orchids

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Corallorhiza striata (striped coralroot) is a rare, leafless orchid from the western USA, Canada, and Mexico. This parasite fully relies upon ectomycorrhizal fungi to obtain energy. Our main goal is to determine if populations in different regions have become genetically, morphologically, and ecologically distinct. We hypothesize that populations in the Coastal Ranges of California and the Sierra Nevada may have evolved as separate species from environmental differences or fungal hosts. We sequenced DNA from the plant nuclear and plastid genomes, and the fungal hosts from specimens collected in coastal California, the Sierra Nevada, and Oregon. We demonstrate genomic, morphological, and fungal host differentiation between the coastal and Sierra Nevadan populations (shown in). High genetic diversity unique to the costal populations suggest possible glacial refugia. We are conducting a novel approach to genotyping via Inter-Simple Sequence Repeats (ISSR) to determine evolutionary history, environmental niches, and adaptation to fungal host genotypes. The ultimate goal is to test the hypothesis that Californian populations represent two distinct species, which will profoundly affect conservation efforts of this rare orchid.

Biological Sciences Poster 14:

Characterizing Plasmid Functional Roles within Tsetse Fly-Associated Symbiotic Bacteria

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Obligate relationships with beneficial microbes occur in a wide range of animals. Tsetse flies are blood-feeders that transmit trypanosomes, the causative agents of sleeping sickness. They also harbor a beneficial bacterium, Wigglesworthia glossinidia, with which they have coevolved for millions of years. This relationship is essential to tsetse reproduction and development, with disruption offering novel strategies for control. The tsetse species Glossina morsitans and G. brevipalpis are evolutionarily distant and differ in their ability to transmit parasites. Genome sequencing of Wigglesworthia from both species reveals significant conservation, including a 5kb plasmid (extrachromosomal DNA). However, it is unknown whether this pattern of conservation also occurs in the expression of plasmid genes and what the relevance of their localization could be. Here, we show through RNA sequencing that expression of Wigglesworthia plasmid genes differs between host species, suggesting functional divergence due to host biology. Plasmid replication was determined using quantitative PCR to further understand its necessity through host life stages.

Biological Sciences Poster 15:

Structure Determination and Evolutionary Linkage of Group II Introns

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Group II introns are self-splicing ribozymes found primarily in eubacteria. Group II introns encode an intron-encoded protein (IEP) which aids in self-splicing and retromobility reactions. Structural and functional features of group II introns and their IEPs have been shown to be highly similar to the eukaryotic spliceosome, suggesting an evolutionary linkage. As group II introns are thought to be ancestors of the spliceosome, group II intron evolution is important to understanding spliceosome evolution. There is currently a gap in knowledge regarding how the IEPs from different intron classes are linked and how group II intron RNAs and their IEPs may have coevolved. This is important as it may lend clues to how spliceosomal RNAs and proteins came together to form the spliceosome. To investigate these questions, IEPs from different group II introns were expressed in bacterial culture and affinity purified. Standard splicing assays were then used to determine if IEPs of one class could splice introns from another. We also generated crystal samples of different IEPs and collected data by x-ray diffraction for structural determination.

Biological Sciences Poster 16:

Macromolecular Crowding Alters Huntingtin Aggregation and Lipid Binding

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Huntington's Disease (HD) is a neurodegenerative disorder caused by an expansion in a polyglutamine (polyQ) domain in the huntingtin protein (htt), which facilitates protein aggregation associated with pathology. Although the expansion of polyQ in htt causes HD, the underlying mechanisms of aggregation have not been fully elucidated. While the cellular environment is known to influence the aggregation process, in vitro aggregation studies of htt are mostly performed in simple buffers. Unlike the buffer systems used to study htt aggregation, the cytosol is a molecularly crowded environment, as it is packed with macromolecules. Crowded conditions can alter the biophysical properties of htt, potentially changing its aggregation mechanism. In this study, various macromolecules were utilized to simulate the crowded environment of the cytosol to determine how this impacts htt aggregation and interactions with cellular surfaces. Htt aggregation and lipid interaction was determined by thioflavin T (ThT) fluorescence, atomic force microscopy, and polydiacetylene lipid-binding assays. Preliminary results suggest that crowding with polyethylene glycol inhibits fibril formation; whereas, polysaccharide based molecular crowding enhanced fibril formation.

Biological Sciences Poster 17:

Diet design for a controlled feeding study to determine salt-sensitivity of blood pressure

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Salt-sensitivity of blood pressure is a major risk factor for cardiovascular disease. Diagnosis requires eating a low-salt and a higher-salt diet each for seven days and measuring blood pressure response. Controlled-feeding, in which all food and beverages are provided, is the gold-standard method of diet studies. However, few report the design procedures and menus which could help improve implementation and thus, early diagnosis. This project aims to detail the development process and the resulting diet. The process of diet design was determined by a literature review. Nutrient composition of the diet was determined using Nutrition Data Systems for Research software. The major categories in diet design include: defining the parameters of the diet, developing low-sodium recipes, creating the menu, analyzing the nutrient composition, and generating food production sheets. A 7-day low sodium menu was developed to provide 2,500 kcal and 1,150 mg of sodium per day. The procedure developed can be used to create consistency in implementing the dietary protocol for testing salt-sensitivity of blood pressure in future studies.

Engineering Poster 1:

User-controlled strategies for effective enzyme immobilization

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Immobilized enzymes, notable for their specificity and biocompatibility relative to other catalysts, present efficacious potential of utilization ranging from cellular drug delivery to blood glucose detection. Advantages of immobilizing enzymes include increased stability and resistance to changes in the environment, namely pH and temperature. Consequently, it is important to study how immobilization's goals of high activity and high enzyme stability can be most effectively achieved. We hypothesized that hyaluronic acid (HYA), a polymer with known ease of chemical functionalization, could be used to achieve biocompatible, efficient support allowing increased enzyme implementation. To test our hypothesis, we used enzyme glucose oxidase known for its potential utilization for human monitoring. Enzyme loading and relative activity after HYA immobilization were determined using colorimetric assays, morphological characterizations were determined by atomic force microscopy, while chemical characterization of the enzyme-based conjugates was performed using Fourier transform infrared spectroscopy. Results demonstrate effective enzyme-conjugates formation, and high loading of such conjugates in hydrogels with reduced activity. Further study explores combining experimental and computational approaches to understand the conditions that allow effective immobilization.

Engineering Poster 2:

Low-Power Gait Analyzer to Aid Parkinson's Disease Diagnosis

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Parkinson's disease (PD) is a neurodegenerative disease that causes progressive deterioration of motor control. Clinical diagnosis of PD can be a long, expensive, and error-prone process. Yet, early diagnosis can diminish symptoms. Observations of gait disturbances offer a means of reliably diagnosing and tracking the progression of PD. Hence, a passive, wearable gait analyzer was proposed to facilitate the long-term study of Parkinsonian gait. Analysis of publicly available, insole load sensor data from the Physionet online database demonstrated that a large ratio between stance time and stride period can be indicative of PD. A mixed-signal duty cycle extractor circuit was designed for gait analysis. Since a low-power system with in-field reconfigurability was desired for this scenario, the duty cycle extractor was constructed on a custom field-programmable analog array, only triggering a microcontroller in the presence of abnormal gait. Accuracy and error rates of the gait analyzer can be selected from a Pareto front by a clinician. In this way, the proposed gait analyzer could bring the diagnosis and study of PD outside the clinical setting.

Engineering Poster 3:

Development of Digital Models for Manufacturing of Surrogate Hands for Impact Tests

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Hand injuries are a significant problem in all industries. Despite the continuous advancements in the technology and the safety procedures for production and maintenance tasks, there are still manual tasks that can produce hand injuries with varying degrees of severity. Metacarpal gloves are often used by workers to protect their hands against impacts, cuts, and other hazards. Testing the impact resistance of different glove designs requires the use of a surrogate hand. This work focuses on the development of a synthetic surrogate hand that can be manufactured and used systematically for impact tests. The making of the surrogate hand starts through the laser scanning of various hands and bones. The digital files resulting from the scans are then repaired, scaled, and assembled through mesh editing software to generate a representative hand size and posture. The resulting digital hand is then converted to a 3D printable bone structure and mold for manufacturing. The resulting digital hand also provides the basis for the development of simulation models of the physical impact testing done on the surrogate hands.

Engineering Poster 4:

3D Printable Graphene-TiO2 Foam Composites for Space Applications

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Society's most recent "race to space"• has pursued the idea of colonizing Mars and the Moon. New materials and manufacturing techniques are necessary in order to achieve this goal. Additive manufacturing (i.e. direct ink writing) of TiO2 based foams has been used for the development of ceramics for space applications including radiation shielding and for photovoltaic devices. Despite their potential, these ceramics have proven to be brittle when subjected to compressive and shear stresses. Advances in the preparation of graphene-based composites have drawn attention due to the material's high strength, surface area, and electrical conductivity. In this study, we investigate the preparation of graphene from graphite and its incorporation into TiO2 foams for direct ink writing of Graphene-TiO2 composites. Mechanical, electrical, and photocatalytic characterization of the Graphene-TiO2 composite foams was performed and compared with bare TiO2 foam to determine the effect of graphene on those properties. The results of this investigation will contribute to improving the foam's lifespan and applicability for use in a harmful space environment.

Engineering Poster 5:

Measuring Gas Adsorption Characteristics of Marcellus Shale with Gas Adsorption Isotherm System

Diego M. Cabanillas,*Yahia Mustafa,*and Kashy Aminian*
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Marcellus shale, is the largest shale gas producing play in US. Shales contain a micropore structure which alongside the organic material in the shales have a significant adsorption capacity. In this study, the Gas Adsorption Isotherm System (GAIS), a state-of-art laboratory set up, which is capable of measuring the gas adsorption characteristics. GAIS is used in this study to measure the adsorption characteristics of a Marcellus Shale sample which can provide the foundation for evaluating the Marcellus Shale's real potential. Detailed protocols are being developed to ensure the system is measuring the adsorption characteristics accurately and with the repeatable results. Key aspect of these protocols are to ensure the results are not skewed by human error such as a leaking component. Lab equipment is properly set up and inspected regularly. These comprehensive laboratory study will help us grasp a better understanding of the shale adsorption characteristics which could improve the gas in place estimation; prediction of the gas to be released during reservoir depletion, and the potential for CO2 sequestration.

Engineering Poster 6:

Human-Swarm Interaction Software Platform

Casey Edmonds-Estes,* Yu Gu, Jason Gross, Guilherme Pereira, Jeongwoo Seo,* Henry Vos,* Nathan Hewitt,* Aleks Hatfield,* Henry Gunner,* Alex Collins,* Julietta Maffeo,* Lunet Yifru,* Neel Dhanaraj,* Rachel Jarmen,* Tucker Johnson,* Ben Buzzo, and Derek Ro
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We present an open-source platform to facilitate research into human-swarm interaction. We have integrated a VICON sensing system with 50 small, simple robots and a flexible, fully predictive software architecture, creating a framework in which many complex swarming behaviors can be tested. To aid in the creation of these behaviors, we have designed the software architecture so that modifying both the information individual robots have access to and the rules each robot will follow is simple and efficient. Finally, we have added a simulation layer to the system which, combined with an Xbox Kinect, makes integrating natural human input straightforward. We demonstrate these capabilities through two very different scenarios: First, a small swarm of robots plays air hockey, demonstrating the capability of the swarm to quickly and gracefully react to a rapidly changing environment. Second, a larger swarm simulates the swarming behavior of hawks in a dynamic human-controlled environment, showcasing the ability of the system to handle complex rules and human input cleanly.

Engineering Poster 7:

Analysis of Vulnerabilities in Ubuntu Operating System

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As cyber-security attacks become more common, they drain resources and expose users' personal and financial information. Certain methods to prevent and avoid such software security vulnerabilities are necessary. Software security vulnerabilities and other issues are tracked by specialized bug tracking systems; the Ubuntu operating system uses Launchpad. Our work was focused on collecting and labeling bugs from Launchpad. We used Python, SQL, and Tableau to extract, store, analyze and label over 340,000 unique bugs reported in Launchpad. For bugs which had a reported Common Vulnerability Exposure number (CVE), our methodology labeled those as security-related and used two national software vulnerabilities databases to assign a Common Weakness Exposure (CWE) number to each vulnerability. We found that security-related bugs made up about 5% of the total number of bugs present in our records and that the two most common security weaknesses were Information Exposure Vulnerabilities (CWE200) followed by Improper Restrictions of Operations within the Bounds of Memory Buffer (CWE119). The extracted data will be used in future research to build software vulnerability detection and classification models.

Engineering Poster 8:

Swarmaneer: A System Design of Human-Robotic Swarm Interactive Platform

Rachel Jarman,* Yu Gu, Jason Gross, GP, Neel Dhanaraj,* Lunet Yifru,* Tucker Johnson,* Julietta Maffeo,* Henry Gunner,* Nathan Hewitt,*Henry Vos,* Jeongwoo Seo,* Casey Edmonds-Estes,* Alexandra Collins,* Alexandra Hatfield,* Ben Buzzo and Derek Ross
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Capitalizing on the new and growing technology of swarm robotics to combat increasing global issues such as search and rescue. Swarmaneer is a robotic platform consisting of fifty self sustaining robots that interact with both their environment and a human operator. The platform is a tool for conducting research and experiments on how humans can interact with a swarm. As an open sourced platform, Swarmaneer allows for other researchers the ability to replicate and test their own algorithms and theories. To ensure ease of usability the platform is manufactured with 3D printed robots and over the counter electronics and sensors. In order to effectively connect groups of people, Swarmaneer contains WIFI technology that allow the sharing of algorithms and test codes. The platform consists of a vicon tracking system with IR reflection and fifty differential drive robots capable of sustaining themselves. The individual robots are equipped with various sensors including color sensors, OLED, and speakers.

Engineering Poster 9:

Classification of Different Mediums of Audio Utilizing Machine Learning Techniques

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One of the primary uses of machine learning is to sift through and classify large volumes of data automatically. This requires a substantial amount of manually classified data for the algorithm to "learn" how to classify a sample based off given features. This type of machine learning, called supervised learning, is especially useful in biometrics applications including security and law enforcement. Current efforts are aimed toward the development of a machine learning algorithm that receives as input various speech recordings from television sources, radio sources, or recordings directly from a speaker, and automatically determines which category they fall under. This technology could be applied in criminal investigations and could also be used to automatically label audio data for different machine learning applications on the generated dataset. The first prototype is being tested on a constrained dataset composed of 50+ hours of audio. The proposed classifier yields an accuracy of approximately 98%. Further development will allow this approach to distinguish a broader array of more complex sources and gather acoustic information from the source room.

Engineering Poster 10:

Optimization of Vicon Motion Capture Marker Placements Using Computational Symmetry

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To study the unsteady aerodynamics of unstable bodies, a Vicon Motion Capture system is used to obtain the position and attitude data in free flight wind tunnel experiments and outdoor test launches. Viable data collection is dependent on a variety of factors, including the distribution of reflective markers upon the surface of the bodies being tracked. This project set out to develop a software tool capable of simulating the placement of these markers in a MATLAB environment. Precursory research indicated that establishing an asymmetric distribution would best improve its efficacy. Therein, the program implements a recursive algorithm that rotates an axis through the geometric center of a randomly generated marker distribution. The symmetry about that axis is then quantified using the distance between the markers after a mirror transformation. This process is done repetitively to identify a comparatively ideal marker distribution. The developed script functions as a viewable marker plotting environment and an optimized marker distribution generator. It is hoped that this tool will establish better practices for any future work utilizing visual object tracking.

Engineering Poster 11:

Quantifying United Nations Sustainable Development Goals Using GREENSCOPE Indicators

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The 2015 United Nations (UN) Sustainable Development Goals were created with ambition to construct a better world by the year 2030. These goals suggest how we should live, and how companies should conduct their businesses. However, they are quite broad with limited methods of quantification. This work proposes a framework that could be used to quantify such goals so that systems' evolutions can be evaluated at different times in their operating cycles. Certain goals were chosen that have a heavy relation to the chemical industry. Using the chemical process sustainability assessment tool GREENSCOPE, sets of indicators that represent these specific UN Sustainable Development Goals are identified and used to quantify a given target within a goal. The identified indicators may be grouped in categories: resource efficiency, recycling, waste management, and resilience. After choosing a set of GREENSCOPE indicators, a case study of an Acetic Acid manufacturing simulation in CHEMCAD is analyzed. The manufacturing process is to be studied and discussed to determine its performance in terms of resilience and sustainability.

Engineering Poster 12:

Multi-Source Domain Adaptive Segmentation of Microscopy Images

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Electron Microscopy (EM) imaging creates high resolution volumes of data representing biological tissues. Volumes are often partitioned into spatial regions with semantic meaning for analysis, delimiting cells or other biological organelles - a process called segmentation. Current automated approaches leverage machine learning techniques based on deep neural networks (DNN), requiring large amounts of annotated training data. When a new EM acquisition originates from a different animal, or a different tissue or tissue staining, its images have different statistics and requires retraining the algorithms on new data, which will have to be annotated. This is extremely labor intensive, costly, and often infeasible. In this work we address this problem by leveraging multiple previously annotated EM datasets, representing different imaging conditions, or source domains, and require only raw data from a new EM acquisition, or target domain, without annotations. We then retrain a DNN for segmentation to work efficiently in the target domain, a process called unsupervised domain adaptation. Our preliminary DNN design has been tested on three EM benchmark datasets giving very promising results.

Engineering Poster 13:

Single-cycle starter for gas-powered oscillating generator

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A gas-powered oscillating linear engine alternator being developed by the Famouri Group can function as a small backup generator in power outages, an off-grid power source, a distributed generation method to reduce transmission losses, and more. Currently, it is started from electronics powered by a 240 volt wall outlet. To propel development forward, research into a starting method from a battery was conducted. We looked into starting methods from a 12 volt lead acid battery that would be relatively robust, small and inexpensive. Due to the high power demand from starting, protection from high current (160 amps) must be integrated into the circuit design for both component and user safety. After looking into charge pumps, voltage lifts, bridge rectifiers, and even marx generators, general results indicate that a switched capacitor converter will achieve this best, offering high power applications while avoiding the weight and price that follow coupled inductors. Understanding that these circuits are relatively inflexible, circuit construction would only be recommended after thoroughly testing to determine the starting conditions.

Engineering Poster 14:

PDMS-Silver Composite Sensors for Strain Monitoring in Human Joints

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Polydimethylsiloxane (PDMS) is a silicone-based material that mimics the skin's capability to flex and stretch, and as such makes it an ideal platform for constructing wearable technologies. The goal of this research is to fabricate conductive, customizable PDMS-silver composite strain sensors. We expect our results to demonstrate that a 30% weight loading of silver flakes into the PDMS is sufficient to create an ink both conductive enough to have continuity while retaining a majority of PDMS's intrinsic ability to withstand over 300% strain. Additive manufacturing techniques such as direct ink writing (DIW) are used to prepare samples of various silver weight loadings into "wires" with thicknesses ranging from 100-500 Âµm. Mechanical testing on these specimens is done for single stress-strain measurements as well as for cyclical fatigue loading. The electrical conductivity and mechanical stability is expected to decrease by only 5% over the course of 10,000 testing cycles which mimic the flexing a human joint would undergo.

Engineering Poster 15:

Designing a Steady State Starter for a Natural Gas-Powered Engine

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Natural gas-powered linear engine-alternators possess an engine which converts the chemical energy of natural gas to the mechanical energy of a linearly actuating magnetized rod. While operating, the magnetic flux from the moving rod cuts through several coils of wire adjacently placed within the system's structure, producing electrical energy. For the natural gas engine, which drives the linear alternator, to fire and begin operating, a sufficient gaseous pressure must be established within its chamber. A possible solution to this utilizes the alternator's armature, the adjacent coils of wire, as a large solenoid, forcing the magnetized rod against the engine's chamber to produce the necessary pressure. A full-bridge direct current (DC) power supply has been designed to draw 1.2 kW of power from a 12 V car battery and "step-up" its DC voltage to about 120 V, the voltage needed to actuate the magnetized rod. Preliminary results show that the proposed converter can produce the output necessary to sufficiently actuate the rod over an extended period, i.e. steady state.

Health Sciences Poster 1:

Evaluation of NL-1 and TT01001 in drug resistant B-cell acute lymphoblastic leukemia

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Despite many advancements in the treatment of pediatric B-cell acute lymphoblastic leukemia (ALL), de novo drug resistance remains an ongoing challenge and is associated with poor patient prognosis. Recently, we developed REH-derived cell lines exhibiting de novo resistance to cytarabine, methotrexate, and vincristine. Targeting of metabolism and cellular energetics has been identified to treat and sensitize cells that have acquired resistance to chemotherapy. Mitochondrial function, and hence cellular energetics has been shown to be mediated by the mitoNEET protein. In this study, two mitoNEET inhibitors, NL-1 and TT01001 were evaluated for their treatment efficacy, possible sensitization mechanism, and interactions with key metabolic and energetic characteristics of leukemic cells. A dose-dependent response was found in parental and drug resistant cell lines suggesting mitoNEET inhibition as a possible mode of treatment. However, preliminary results do not show a sensitization mechanism when NL-1 and TT01001 were paired with respective drugs for each resistant line. Parental and resistant cells treated with NL-1 and TT01001 showed reduced free fatty acid content and mitochondrial activity.

Health Sciences Poster 2:

The influence of short chain fatty acids on intestinal epithelial cell activity

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Intestinal epithelial cell (IEC) linings of stroke patients become more permeable post-stroke, potentially leading to migration of microbes into the circulatory system and opportunistic pathogens. We hypothesize short-chain fatty acids (SCFAs), a by-product of many intestinal microbes, may possess immunomodulatory activity that helps prevent leakage of microbes from the gut. Here we used MODE-K and HT-29 IECs to investigate if SCFAs increase expression of major histocompatibility complexes I and II (MHCI and MHCII), and/or the production of interleukin 6 (IL-6), an inflammation-associated cytokine. Expression of MHC I was enhanced by interferon-γ (IFN-γ) stimulation, as seen by flow cytometry. We hypothesize that both MHCI and MHCII will be further increased by SCFA exposure. IL-6 production was measured following 24 hours of lipopolysaccharides (LPS) stimulation +/- acetate, butyrate, or propionate by ELISA. Preliminary results suggest that low concentrations of butyrate and propionate may increase IL-6 production. By better understanding IEC immune responses induced by SCFAs, we can develop methods using SCFAs to promote host defense against infection.

Health Sciences Poster 3:

Development of in vivo alkaline phosphatase measurement using electron paramagnetic resonance imaging

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Studies have shown that a correlation exists between elevated levels of alkaline phosphatase and many liver/bone related diseases, including cancer. In this work, we focused on developing advanced electron paramagnetic resonance (EPR) probes sensitive to alkaline phosphatase for use in measuring enzyme activity in vivo. In previous work, alkaline phosphatase was measured in vitro using nitroxide radical based spin probes, however, their use in vivo is limited due to their fast reduction in biological systems. Instead, triarylmethyl (TAM) radical based spin probes were functionalized toward alkaline phosphatase due to their high stability in vivo, narrow EPR linewidth, non-toxic properties, and good water solubility. This method utilizes the interaction between alkaline phosphatase and a target moiety attached to the TAM radical to evoke a change in the EPR spectrum relative to the enzyme activity, thereby achieving imaging capabilities. Moreover, our strategy uses an organic radical as a contrast agent unlike many common ones which are based on paramagnetic metals such as gadolinium, manganese, iron, etc. that have increased concern related to their accumulation and toxicity.

Health Sciences Poster 4:

Fluorescently labeled antibodies map tumor environment to enhance cancer patient survival

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Studying human samples in immunology research is essential for understanding how cancer affects the body but leaves holes due to ethical concerns. Using mouse samples and creating a protocol to understand the communication that occurs between different markers in the tumor environment is essential. Cyclic immunofluorescence combines the innovative technique of antibody staining with the ability to stain a sample multiple times to determine the location of markers in mouse tumor tissue. This technique utilizes a diluted base to inactivate the sample and is gentler than the prior method of antibody stripping, which bleaches the sample, making it impossible to re-stain. By performing this cyclic process an overall map of the sample can be formed. This map will teach specialists more about how the tumor environment changes as the tumor changes. Preliminary data is expected to display different patterns for different tissue samples and a reduction in immune markers, indicated by the fluorophores, in progressive stages. By understanding this environment doctors will have an easier time identifying which treatment a patient will respond to best.

Health Sciences Poster 5:

Investigating fetal bovine serum effects on Bordetella pertussis gene expression and growth

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Bordetella pertussis is the infectious agent responsible for whooping cough. Despite a successful immunization regiment, there has been a steady resurgence of the disease since the 1970's. In order to improve the acellular pertussis vaccine, it is crucial to better understand the pathogenesis in humans. A previous study has demonstrated that when grown in serum-supplemented pertussis medium, Stainer Scholte Medium (SSM), there is an increase in a major virulence factor, suggesting that the serum plays a major role in virulence regulation. Our preliminary data suggests that fetal bovine serum (FBS) added to SSM causes an increase in the number of bacteria produced within the first 24 hours. Using RNA sequencing, our long-term goal is to compare gene expression differences between strains when grown in SSM versus SSM supplemented with 10% FBS. We hypothesize significant differences in gene expression in media versus serum-supplemented media. This data will improve our understanding of how B. pertussis grows in its host and will therefore be vital information used in our approach to vaccine development.

Health Sciences Poster 6:

Chronic intestinal dysbiosis in a mouse model of Alzheimer's disease

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As an influential component of the gut-brain axis, the intestinal microbiome influences specific neurologic and gastrointestinal pathologies based on altered gut microbial composition. Intestinal dysbiosis has been demonstrated in many neurological disorders such as Alzheimer's disease (AD), but the factors which underlie the age of onset and severity of gut dysbiosis are not well understood. To assess this, fecal boli were collected from wild (WT) type and AD transgenic mice (CVN-AD) at 1,3,6, and 12 months of age for 16s rRNA sequencing to determine changes in gut microbial composition. Alpha-diversity between CVN-AD and WT mice showed a significant interaction between age and genotype ($p=0.002$). Similarly, beta-diversity between genotypes at 1,3,6, and 12 months was also significant ($p<0.001$). Additional taxonomic analysis showed differences ranging from the phylum to genus levels, including a diminished abundance of the phylum Actinobacteria and the beneficial bacteria family, Bifidobacteriaceae, in CVN-AD compared to WT mice. These results establish that intestinal dysbiosis is sustained throughout the lifespan of CVN-AD mice and suggest that it may contribute to the pathophysiology of AD.

Health Sciences Poster 7:

Developing novel biomarker-based in vitro pertussis toxin neutralization assay to evaluate protective antibodies

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Bordetella pertussis (Bp)-the causative agent of whooping cough-uses its namesake pertussis toxin (PT) to impair innate and adaptive immune responses to facilitate infection. Despite an incomplete mechanism for pertussis immunity, it is universally appreciated that antibody-mediated PT neutralization is required for protection. To assess the toxin neutralizing capacity of antibodies produced via vaccination we revisited the classically used, qualitative Chinese Hamster Ovary (CHO) cell toxin neutralization assay. We propose to optimize this assay with a quantitative element, enhancing sensitivity and specificity. We used RNA sequencing to identify an inducible genetic biomarker that is differentially expressed in discrete PT concentrations, including: 100, 50 10 and 1 ng/mL. Two genes known to encode regulatory proteins were identified via RNAseq: Krueppel-like factor 3 (klf3) and Mitogen Activated Protein Kinase (mapk). Further validation via qPCR analysis is actively being pursued, with preliminary results consistent with RNAseq findings. We hypothesize that cloning the promoter region of these PT-biomarker genes into a pGL4.29 luciferase reporter plasmid will provide a novel quantitative alternative to the traditional assay.

Health Sciences Poster 8:

Visualization of innate immune cell pathogenicity post ischemic stroke using histopathological techniques

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The promotion of inflammation by the innate immune system following the occurrence of ischemic stroke in the brain is critical to tissue repair, but has also been shown to inflict further damage as monocytes migrate to the brain and interact with resident brain immune cells like microglia. An understanding of these interactions as well as the cellular signals required to activate and direct them is crucial to begin understanding how to prevent damaging side effects such as permanent tissue damage and even infection following an ischemic episode. Our first step in achieving this understanding is visualization of these cell populations in murine stroke models. Staining of tissue sections using various methods displayed patterns of neural cell death which correlated to fluorescent scans of similar sections from reporter models and displayed the congregation of immune cell populations in ischemic regions. Future steps will include visualization of these cells in genetically altered models to elucidate cellular signaling as well as live imaging of monocytes to track their entry and movement within the brain.

Health Sciences Poster 9:

Determining the Functions of Monoclonal Antibodies against Pseudomonas aeruginosa.

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Pseudomonas aeruginosa (P.a.), a bacterium that causes multitudes of infections such as urinary tract and skin infections, and both acute and chronic pneumonia. Due to the inherent antibiotic resistance of the pathogen, there is an urgent need for alternative treatments for P.a. infections . Monoclonal antibodies are valuable care options based on their high-specificity and reduced side effects when compared to other treatments. We have previously studied vaccine antigens against P.a., such as the protein FpvA, that are protective in mice. We hypothesize that monoclonal antibodies isolated from FpvA vaccinated mice can be effective treatment options against P.a. We developed monoclonal antibodies from FpvA vaccinated mice to assess the medical viability of this treatment. To determine the therapeutic potential of these antibodies, we first verified that they bind the surface of various clinical P.a. isolates using the ELISA technique. We then performed opsonophagocytosis assays to verify their functional role. Our results indicate that monoclonal antibodies against FpvA can bind and facilitate killing of P.a., supporting their use as treatment for P.a.

Health Sciences Poster 10:

The role of WISP1 gene in Zebrafish (Danio rerio)

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Wnt family members play an important role in many developmental processes in humans and other animals, they also have been linked to tumorigenesis. Here, we investigated the role of the WISP1 gene, a member of this family that has been related to melanoma metastasis in humans. Zebrafish was the model selected for this experiment due to the rapid development of zebrafish embryos and WISP1 being in their genome. This was done by injecting embryos with MOs (Morpholino oligonucleotides). According to previous research, MOs are the most common technique of gene knockdown in zebrafish. The experimental plan was to collect embryos from wildtype fish and inject them with the desired morpholino, raising the embryos and comparing the differences in phenotype between experimental and control groups. The morpholino groups used include WISP1 with GATA4, scrambled, and uninjected as controls. The expected and achieved results are more bone deformation and greater heart edema in the WISP1 and GATA4 groups. To quantify this data, lower jaws are dissected and measured to see the differences between groups.

Health Sciences Poster 11:

Evaluation of MMP9 Inhibitor Andecaliximab as Inhibitor of HNSCC

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Head and neck squamous cell carcinoma (HNSCC) is a highly invasive cancer, primarily caused by tobacco and/or associated alcohol consumption, or by infection with human papilloma virus. HNSCC invasion damages the soft and bony tissues of the craniofacial region, severely compromising local organ structure and function. There is a need for more specifically targeted, patient tolerated anti-invasion therapies. Matrix metalloproteinases (MMPs) are enzymes secreted by HNSCC cells that destroy the surrounding extracellular matrix, permitting rapid tumor spread. Past work suggests that global MMP inhibition is toxic in patients and ineffective. Andecaliximab is a second-generation monoclonal antibody drug against MMP9 that is well tolerated and is currently in clinical trials against diseases with high MMP9 expression. Here we evaluated the effectiveness of Andecaliximab in impairing HNSCC invasion in the pre-clinical setting. Andecaliximab treatment of HNSCC cells as a single agent was ineffective in impairing HNSCC invasive properties. These data suggest that inhibition of additional MMPs produced by HNSCC cells or the tumor microenvironment is required for further development of anti-invasion strategies in this disease.

Health Sciences Poster 12:

The Influence of Obesity on the Risk and Severity of Enteric Bacterial Infection

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The global incidence of obesity has risen over the last three decades. West Virginia ranks first in U.S. prevalence with an adult obesity rate of 38.1%. Obesity increases the risk of heart disease, diabetes, and cancer. However, there is limited information about the impact on infectious disease. We hypothesized that chronic inflammation and changes in gut microbiota during obesity increase the severity of enteric bacterial infections. Stool samples from obese and non-obese individuals infected with Campylobacter jejuni, Salmonella enteriditis, or Clostridium difficile were analyzed for inflammatory markers, microbial profiles, and pathogen burdens. Separately, the TriNetX system was used to obtain deidentified information from patients infected with the same bacteria throughout 24 U.S. hospitals. Although the stool sample study cohort size is not yet large enough to generate robust conclusions, some findings support the hypothesis. Additionally, TriNetX data showed increased abundance of leukocytes and associated inflammation in obese patients. Understanding a link between obesity and infectious disease would prompt discussion to inform populations of disease risk and lifestyle changes that can reduce susceptibility.

Health Sciences Poster 13:

Fabrication and Biodistribution of IL-12 Loaded PLGA Nanoparticles for Immunotherapeutic Treatment of Osteosarcoma

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Treatments for metastatic osteosarcoma have seen little progress in the past 25 years, with the prognosis remaining relatively poor. While immunostimulatory cytokine therapy has shown promising results in murine models, dosing issues currently prevent these treatments from reaching a clinical setting. Our research sought to evaluate the potential of poly(lactic-co-glycolic acid) (PLGA) nanoparticles for solving these dosing problems. In this study, we evaluated the effects of various fabrication parameters on nanoparticle morphology and elution using scanning electron microscopy and enzyme-linked immunosorbent assay (ELISA) respectively. We also evaluated the effects of the nanoparticle fabrication process on the stability of free interleukin-12 (IL-12). Lastly, the biodistribution of fluorescent PLGA nanoparticles was determined in-vivo using tissue dissociation and analysis on a fluorescence plate reader. The results indicate that the encapsulation of IL-12 in PLGA nanoparticles provides sustained elution at therapeutic levels out to 14 days with expected distribution throughout the body, demonstrating a potential route for bringing immunostimulatory cytokine therapy to the clinical setting.

Health Sciences Poster 14:

Characterization of Drug Resistant Cell Lines of B-cell Acute Lymphoblastic Leukemia

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Despite advances in the treatment for B-cell acute lymphoblastic leukemia (ALL), relapse remains an issue, in part, due to mutations leading to drug resistance. In an effort to overcome this drug resistance, our lab created two chemo-resistant cell lines using agents (Cytarabine, Methotrexate, or Vincristine) that are part of the standard of care regimens. The two parental cell lines, REH and SupB15, were exposed to repeated low doses of these chemotherapeutics until they were resistant. We then investigated differences between the parental and resistant lines by characterizing proliferation rates, the cell cycle, protein expression, mitochondrial activity, lipid quantity, and basal metabolic profile. We observed that all the tumor cells had an aerobic glycolytic phenotype, decreasing their reliance on oxidative phosphorylation even in the presence of oxygen, and increasing glycolysis. It also appeared the cells are using an alternative energy source, all of which allow them to adapt to microenvironments not favorable for normal cells. This characterization could help identify potential targets for treatment if a patient has a relapse and is resistant to standard therapies.

Health Sciences Poster 15:

Sex Chromosomes and Gut Microbiome Metabolites Interact to Modulate Antibody Responses

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Females tend to elicit stronger humoral immune responses to immunization than males. Previous data from our lab suggests that such differences are both sex chromosome and gut microbiome-dependent. Acting as histone deacetylase (HDAC) inhibitors, short chain fatty acids (SCFAs)-molecules produced by gut microbial metabolism-increase humoral immune responses both in vivo and in vitro by influencing the expression of genes associated with isotype switching. Further, the X chromosome encodes several immune-related genes. Considering the known role of HDACs in X chromosome silencing, we hypothesize that SCFA exposure may induce immune-related gene dosage effects between males and females, thereby influencing humoral responses in a sex chromosome complement-dependent manner. To test this, splenocytes and B cells isolated from male four-core genotype mice were simulated with lipopolysaccharide +/- propionate. IgM and IgG antibody production were evaluated by ELISA and flow cytometry. While total antibody production decreased in propionate stimulated cells, IgG/IgM ratios were increased in preliminary studies. Future studies will compare SCFA effects on B cells between all XX and XY male and female genotypes.

Health Sciences Poster 16:

The Chemotactic Potential of Myeloid Derived Suppressor Cells during Murine Neonatal Sepsis

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Immune suppressive myeloid derived suppressor cells (MDSCs) are a heterogenous population of immature myeloid cells that are more abundant in neonates. We hypothesize that MDSCs migrate to sites of infection and compromise host immunity early in life. Neonatal sepsis is a significant cause of infant mortality. In an Escherichia coli-induced neonatal sepsis model, we measured expression of chemokines in the spleen, liver, and kidney by PCR array. CXCL1, CCL7, CCL12, and CCL19 were strongly upregulated in peripheral tissues following infection. In MDSCs isolated from infected mice, there is an increase in CCR7 gene expression. Flow cytometry analysis further demonstrated that MDSCs isolated from the spleen and bone marrow of infected pups had increased cell surface expression of CCR7, CCR2, and CXCR2. In vitro migration assays demonstrate that MDSCs migrate toward chemokines produced by infected tissues. Future experiments will determine if MDSCs have increased migration potential during infection. This paves the way for enhanced understanding of the role of MDSCs in regulating the host response during early life infections.

Health Sciences Poster 17:

Impact of Ozone and Ultrafine Carbon Black Co-Exposure on the Development of Asthma

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Asthma, a chronic lung disease, impacts more than 20% of the US population. Episodes of increased air pollution precede significant increase in cardiopulmonary hospitalizations. We hypothesized that a realistic inhalation co-exposure to constituents of air pollution (ozone and ultrafine particles of carbon black) can significantly alter the immune mechanisms through which house dust mite (HDM) allergen induces asthma. We exposed C57Bl/6J mice to HDM allergen by intra nasal route on alternate days for 3 weeks and inhalation exposure to particles was performed once a week. We sacrificed mice 24 hours after the last HDM challenge and measured changes in lung function, lung cell death, alveolar barrier damage and lung inflammation. We observed significant changes in lung injury, alveolar barrier damage, airway hyper responsiveness and lung function decline in carbon and ozone co-exposure mice compared with HDM alone. In conclusion these results indicate the ability of the environmental exposures to modulate the process of allergic lung sensitization. In our ongoing studies we are elaborating the mechanisms (immune cell and mediators) involved in the observed responses.

Health Sciences Poster 18:

Making a Case for Treating Substance Use Disorder: A Family Disease

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Adverse childhood experiences (ACEs) are linked to negative health and behavioral outcomes such as substance use disorder (SUD). Women are disproportionately affected by ACEs, and children are often negatively affected by parental ACEs. This study will examine the relationship between ACEs and substance misuse in women, while exploring ACE prevalence in their children. Descriptive analyses, including chi-square test and t-test, were conducted to compare a sample of women with SUD (n=50) to those without (n=50). The relationships between ACEs and multiple types of substance misuse were significant. ACE scores were higher in women with SUD (M=4.860, SD=2.9) relative to controls (M=1.86, SD=2.0); t (86.902) =6.012, p = <.001. Children of women with SUD (M=3.92, SD=2.3) had higher ACE scores relative to the control group's children (M=1.37, SD=2.1); t (63.008) = 4.816, p = <.001. A moderate positive relationship existed between maternal and child ACE scores. The high rates of ACE in women with SUD and their children suggest that trauma-informed family-based substance use treatment should be strongly considered for prevention and treatment of SUD.

Health Sciences Poster 19:

Gender Differences in Immune Checkpoint Expression in Lung Cancer Cell Lines After Radiotherapy

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The field of cancer therapy has been revolutionized by emerging immunotherapies, utilizing the body's own immune system to fight a tumor, often via administration of antibodies against immune checkpoints. Though an exciting technique, immunotherapy alone does not provide a complete response. Optimal treatment strategies likely include a combination of chemotherapy, radiotherapy, and immunotherapy. However, there is not yet a definitive order for which to administer these treatments to yield the most effective results. It is unknown if expression of immune checkpoints changes after radiotherapy and if expression could differ between males and females, who are known to have differences in both overall immune response and response to immunotherapy. This study aims to investigate expression of immune checkpoints in both male and female lung cancer cell lines after radiotherapy. Our preliminary results suggest a difference in gene expression of both PD-L1 and PD-L2 at the mRNA level between males and females after radiation. Currently we are performing Western Blot and FACS Analysis to determine potential expression differences between sexes at the protein level.

Health Sciences Poster 20:

Towards the identification of factors responsible for cortactin-independent tumor cell invasion

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Head and neck squamous cell carcinoma (HNSCC) is a neoplasm of the oral cavity associated with extensive regional invasion and lymph node metastasis. Cortactin (CTTN) is a actin cytoskeletal regulatory protein frequently overexpressed in HNSCC. Proper regulation of the actin cytoskeleton is crucial for digestion of the extracellular matrix through generation of invadopodia. While previous work has implicated cortactin as essential for invadopodia production, we have shown that genomic disruption of CTTN in HNSCC cell lines with CRISPR/Cas9 technology does not abolish invadopodia formation or 3D invasion in HNSCC. In order to identify molecules that compensate in cortactin-independent invasion, RNA-sequencing (RNAseq) was conducted of all transcripts across CTTN deficient lines. This work identified the actin regulatory protein radixin (RDX) as upregulated in cortactin-null cells. Future work will evaluate the ability of RDX in compensating for cortactin loss in HNSCC invasion, a key step in the development of rational anti-invasive therapeutic development.

Human Engagement Poster 1:

Novice and Expert Differences in Reviewing Student Work

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As peer assessment becomes more common in college classes, it is important to understand developmental differences in reviewing student work because the findings could inform future instruction. By comparing novices to experts, similarities in reviewing strategies represent existing knowledge that could serve as starting-points to build upon, and the differences signify areas for growth. In the current study, we analyze eye-tracking and think-aloud data of one undergraduate student and one assistant professor. The participants reviewed two essays about the long-term effects of living in a technological world. The essays varied in quality: only low-level errors (e.g., grammar, spelling) and only high-level errors (e.g., lacking thesis, disconnected ideas). From the feedback, we will present the types of errors identified, described, and solved. The expert is expected to focus on high-level errors more often than the novice. Eye-tracking data (i.e., fixation points, sequences of fixations) as well as think-aloud protocols will be used to guide future instruction.

Human Engagement Poster 2:

Asylum Law: A Comparative Policy Analysis Between the United States, France, and Germany

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Given the current humanitarian crisis at the U.S. border, the legislative restructuring of American asylum policy is necessary to better accommodate the needs of migrants forced to flee their countries of origin. By viewing the admittance of asylum seekers as a humanitarian responsibility, this research offers policy comparison between American, French and German asylum laws, proposing solutions through a globalized sharing of ideas. Three areas of needed reformation within the American system are: use of expedited removal, life-threatening journeys taken to the U.S., and poor conditions within asylum detention centers. This research suggests eliminating expedited removal, a process which allows immigration officials to illegally deport undocumented immigrants within 100 miles of any American border, and also eliminating the policy of denying them legal counsel. France and Germany also struggle with limiting life-threatening journeys taken to seek asylum, therefore an alternate solution must be found for this issue. Additionally, the conditions of detention centers for asylum seekers must be improved to offer basic human necessities, such as: hygiene products, three meals/day, and free health services.

Human Engagement Poster 3:

Active Learning: Why is this effective teaching technique not used more often?

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Lecturing has been the primary approach to instruction since universities were founded in Western Europe over 900 years ago. Recent studies suggest that student performance significantly increases with active learning (ex: group work and discussions that solicit student input) compared with lecturing, where students may be passively listening. It has become apparent that after encouraging the implementation of this teaching style throughout the mathematics courses, that it is not happening as often as wanted. In our qualitative research study, we seek to determine barriers that faculty have encountered concerning the implementation of active learning strategies. So far, we have interviewed experts and graduate students who regularly use active learning to see when they use active learning, why they don't use it more often, and some of the obstacles they have encountered. Data analysis is ongoing, but preliminary results indicate that the common obstacles include physical constraints of classroom space, instructors' ability to manage large numbers of students, and specific content that may not permit as much exploration.

Human Engagement Poster 4:

Between two worlds: power, politics, and noblewomen in early modern Europe

Jessica Hogbin* and Matthew Vester[1]
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Noblewomen, who have often been obscured in history, have been interpreted in various ways throughout the centuries. This historiographical analysis will span from writings by historians of the seventeenth century to contemporary authors. By combining what other scholars have written about numerous other noblewomen and reading primary documents by women of this status, the picture of early modern noblewomen becomes clearer and more dynamic. They were women in between two worlds, serving multiple purposes. Their motivations were more complex than any one-dimensional term can imply. They had ties and responsibilities to their paternal and marital families; they were mothers, daughters, sisters, and politicians. For these early modern noblewomen, these terms were not exclusive. Instead, they were simultaneous titles that they precariously balanced. Through this research, a fuller idea of the roles of women in power is developed among present-day historians, which can be built upon as individuals from the early modern period are studied.

Human Engagement Poster 5:

Construction of Personal Identity Within Postmodern Society

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In the postmodern context, personal identity forms around commercial objects and mediated imagery. Society constructs a typology of personal identities available for choosing-as long as they perpetuate social ideals and corporate industry. Far easier is it to define oneself through commercial products and societal expectations than to truly ask What am I?. This collection of artwork draws attention to postmodern loss of personal identity by providing surrogates for the viewer's body. The artworks utilize traditional painting methods, but reference societal constructions through incorporation of found objects and industrial products-deviations which engage the ontology of the work through sculptural uses of space. The resulting artworks are simultaneously individualized by the application of paint and homogenized by the manufactured materials; they metaphorically become human. By presenting phenomenological, body-referencing art-objects through the combination of commercial products and painted imagery, the artworks engage the viewers' own convoluted identities, and question where the split between natural and constructed truly lies.

Human Engagement Poster 6:

Camp FeWi: addressing the decline in female sport participation

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Research continues to prove that adolescence is a pivotal time for developing healthy behaviors and active lifestyles. Sport participation has direct benefits to youth. Through their learned experiences in sport, youth develop confidence, leadership skills, positive self-concepts, and a sense of connection to their schools/communities.Which in turn lead to long term benefits relative to career and health. Despite these advantages, there has been a significant decline in the number of young females choosing to take part in sport. Operating as an "earn and learn" program, Camp FeWi matches general participants with mentors in a six-week program where females from urban Pittsburgh are exposed to non-traditional sports (e.g., golf, tennis, and lacrosse). This study engages general participants, youth mentors, and coaches in semi-structured focus groups and surveys to understand and address the structural attributes hindering female sport participation .Data suggests that exposing youth to sport at an early age prompts them to continue pursuing sport. Through this exposure youth are more likely to gain self-confidence and leadership skills through sport participation than without.

Human Engagement Poster 7:

Combatting negative depictions of Appalachia by analyzing diversity and inclusivity within the region

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Appalachia has been wrongfully depicted as a homogeneous region inhabited by backward individuals who lack proper education. Consequently, this has created an implicit bias that is detrimental to those living both inside and outside of Appalachia. In this study, interviews were conducted with people considered to be regional activists, identifying as both Appalachian and advocates for their communities. Questions about diversity and inclusivity in the region were asked in addition to inquiring about what work can still be done. The mutual consensus amongst the participants was that - although there will always be progress to be made - one cannot discredit the economic and cultural diversity that exists here, nor can they erase Appalachian individuals who belong to a range of demographically diverse groups. This study is significant because identifying and compiling a network of activists who are affecting change serves as a catalyst for a positive portrayal of the region. This network can now expand and be shared with others in hopes that a more accurate representation of Appalachia can be curated and maintained.

Human Engagement Poster 8:

Feedback mechanisms on alphabay market

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Darknet markets are websites on the TOR network, an anonymous network that can be accessed by a specialized web browser, where users can buy and sell illegal goods. The most notable of which being the SilkRoad which was shut down in 2013. Given the anonymity of Darknet markets buyers face uncertainty when purchasing products because they have imperfect information about their seller and the product. Using archived copies of Alphabay market I scraped listing data such as listing title, listing category, price, amount sold, item description, feedback and rating per listing. I use Latent Dirichlet Allocation from the Natural Language Toolkit in Python to find abstract topics inside of each listing's description. Using the completed dataset, I hypothesize that sellers who include longer descriptions with shipping information attract more buyers which results in more positive feedback. I also hypothesize that sellers with a higher trust level can command a higher price for their listings

Neuroscience Poster 1:

Scaling of muscles in young adults while experiencing external disturbances during sit-to-stand motion

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Many older adults have difficulty with the sit-to-stand motion, which is fundamental for daily life. Preventing a fall when a loss of balance occurs during sit-to-stand requires appropriate muscle recruitment. As a first step to understanding muscle recruitment in fall prevention during sit-to-stand is altered in older adults, we investigated how healthy young adults recruit muscles to maintain balance after experiencing external disturbances during sit-to-stand. Electromyography (EMG) was collected from six hip, knee, and ankle muscles from each subject. After performing the sit-to-stand motion as they would normally, subjects were exposed to external perturbations timed to occur after the subject began to stand. Perturbations were delivered through movement of the support surface 15cm forwards or backwards at different velocity and acceleration combinations in random order that were each designed to produce different amounts of balance loss. Although sit-to-stand involves coordination of muscles across the entire leg, preliminary results indicate that subjects mostly use the muscles around their ankles to maintain balance in response to perturbations regardless of the level or direction of balance loss.

Neuroscience Poster 2:

Effects of Traumatic Brain Injury and Methylphenidate on Punishment Preference and Premature Responses

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Traumatic brain injury (TBI) affects millions of people each year, commonly resulting in lasting cognitive deficits. Methylphenidate (MPH) has been proposed as a pharmacological treatment for TBI; however, recent research showed that MPH exacerbated TBI-induced cognitive deficits, including risky decision making and motor impulsivity. This study further explores this affect. We used a modified version of the Rodent Gambling Task (RGT), in which rats choose between low-risk options with small rewards, or high-risk options with large rewards. In order to assess preference for risk, the overall reinforcement rates must be held equal: 30% chance of a 3-pellet reward, 45% chance of a 2-pellet reward, and a 90% chance of a 1-pellet reward. The nose-poke holes that deliver more pellets are riskier, but each still results in the same reinforcement rate. This allowed us to determine if there is a preference for risk or decreased loss aversion. We expected MPH-treated-TBI rats to display decreased loss aversion, demonstrating that MPH should not be used to treat TBI patients.

Neuroscience Poster 3:

Pavlovian-to-instrumental transfer in rats with frontal traumatic brain injury

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Although there is a significant amount of literature evaluating the effects of traumatic brain injury (TBI) on neuropsychiatric deficits commonly associated with addiction behavior, like risky decision-making and impulsivity, the understanding of environmental cue sensitivities in this area is relatively limited. The current study utilizes Pavlovian-to-instrumental transfer (PIT), a mechanism often used in addiction models, to evaluate how cue sensitivities are affected by TBI in rats. In the current study, 12 male Long-Evans rats were subjected to a bilateral frontal controlled cortical impact (CCI) injury (AP/ML/DV +3.0/, +0.0/, -2.5 @ 3 m/s), while another 12 rats served as shams. Animals were conditioned on several tasks over a total of 24 sessions. Behavior was assessed on the PIT task which combined both Pavlovian and instrumental conditioning protocols to evaluate cue sensitivities. Preliminary data suggests that TBI reduces sensitivity to reward-predictive cues and conditioned reinforcers. Though further investigation is necessary to develop a stronger understanding of this phenomenon, it is hypothesized that these sensitivities may be due to alterations in dopaminergic functioning and motivational salience.

Neuroscience Poster 4:

Association between social behavior and face responsiveness in the human brain

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Face perception plays a key role in human's social behavior. Using functional magnetic resonance imaging, distributed brain areas dedicated to this process have been defined reliably. However, activation strength and patterns within these areas vary substantially across individuals. Whether such individual difference is related to social behavior in healthy individuals has not been reported. In this study, we investigated this question by correlating the strength of neural activity in face-selective brain areas with behavioral data reflecting social personality traits, including autism quotient (AQ), social responsiveness scale (SRS) score, and rating consistency in facial dominance and trustworthiness judgements. The selectivity strength is indicated by various assessments, including average activation magnitude, maximum activation magnitude, extent for each activated brain region and a measure of global face selectivity across brain regions. Our results showed a significant correlation between behavior with 1) activation magnitude in left amygdala, ATL, and right aSTS, and 2) size of the right pSTS and IFG. These findings suggest that prosocial behavior is achieved by greater brain response to faces.

Neuroscience Poster 5:

Timing of Audiovisual Integration in Individuals with Autism

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Autism is characterized by repetitive behaviors and challenges with social skills and communication. In addition, many individuals with autism have wider temporal binding windows (TBW) for some sensory stimuli. The TBW refers to the period for different senses to be integrated in the brain and perceptually bound. Precise temporal integration is critical to the development of language and motor skills. Thus, it is believed that having a wider TBW may contribute to core deficits of autism. Further, participants with autism whose TBWs were unable to be measured based on the current 500msec timeframe are excluded from studies as it has been assumed, they are not complying with the task. We believe their TBWs may be wider than what is currently being measured. Thus, the purpose of this study is to investigate TBWs in individuals with autism beyond the standard timeframe (500msec) to determine at what timepoint they would perceive two pieces of sensory stimuli as asynchronous. We will gain a better understanding of the audio-visual integration capabilities of this subgroup of individuals with autism.

Neuroscience Poster 6:

Sensorimotor adaptations to asymmetric stride length constraints during locomotion in humans

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People with neural or peripheral damage to the motor system recover locomotion with often observable asymmetric limb coordination. The recovery is accomplished through the sensorimotor adaptation within the CNS and characterized with spatiotemporal changes in the patterns of muscle activity. We have recruited 10 healthy volunteers to walk on a treadmill in symmetric and asymmetric tasks with the goal of documenting the patterns of adaptation/de-adaptation to asymmetric conditions. The asymmetric adaptation tasks was imposed by wearing an exoskeletal stride length constraint. Electromyography was recorded from select muscles of both legs representing the main muscle groups. Supervised burst detection algorithm was used to mark bursting in gastrocnemius (ankle extensor) muscles. The averages with confidence intervals were superimposed for the early and late adaptation periods. The asymmetric gait adaptation caused by step length constraint was accomplished by the spatiotemporal change in muscle coordination. These results demonstrate a robust adaptation mechanism that can be used for the rehabilitation of symmetric locomotor gait and the consequent improvement of the quality of life.

Neuroscience Poster 7:

Investigating the Role of Circadian Rhythms on Serotonergic CSD Neurons in Drosophila melanogaster

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Circadian rhythms are crucial for all living things because the 24-hour light cycle is the most predictable external cue to which internal biological processes can be synchronized. Recent studies, particularly in Drosophila, have illuminated much of the molecular mechanisms of the brain's "clock neurons"• whose coordinated activity generates the circadian rhythm. However, questions remain about how clock neurons influence their synaptic partners. We used Drosophila melanogaster to test the behavioral effects of "master clock" neurons called the s-LNvs onto a pair of serotonin neurons involved in olfaction, the CSDns. We previously found that the s-LNvs synapse onto the CSDns, which express the receptor for PDF, a neurotransmitter released by the s-LNvs. This suggests that the CSDns may influence the olfactory system in a circadian manner. To test this, we genetically reduced CSDn activity and monitored circadian-dependent locomotor activity, as well as tested odor sensitivity at different timepoints throughout the day. The goal of this research is to determine if the CSDns influence circadian rhythms or are regulated in a circadian manner.

Neuroscience Poster 8:

Perception Threshold of External Disturbances to Locomotion in Healthy Young Adults

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Older adults are at a high risk of falling during locomotor tasks such as walking. The long-term goal of this project is to investigate whether the ability to perceive a locomotor disturbance is altered throughout the aging process and associated with an increased fall risk. As a first step, the perception threshold of locomotor disturbances in healthy young adults was investigated. Participants walked on a dual-belt treadmill at their self-selected speed (SSWS). Every 8-12 strides, participants received a short duration change in velocity of a single belt of the treadmill triggered at heel-strike. Velocity change parameters (i.e., amplitude, direction, and leg) were randomized. After each perturbation, participants were prompted to response Yes/No if they felt the perturbation. Participants wore headphones with noise to eliminate auditory cues from the treadmill. The perception threshold was identified by fitting the data using a psychometric curve. Preliminary results from 5 participants (SSWS = 1.12±0.09 m/s) demonstrate that healthy young adults are able to consciously perceive very small disturbances during walking (Δvelocity = 0.07±0.02 m/s or 6.7±2.2% of SSWS).

Neuroscience Poster 9:

The Effects of High-Fat Diet on Risky Decision Making and Impulsivity in Rats

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High-fat diet (HFD) consumption can cause both cognitive deficits and inflammation in the brain. The aim of the current study was to observe the effects of an HFD on risky-decision making and motor impulsivity in a rodent model. Rats were randomly assigned to receive an HFD or low-fat diet (LFD) and were trained to nose-poke into four different holes in a standard operant chamber. Then, rats began the Rodent Gambling Task, during which they were allowed to freely choose among the holes. Responses in each hole were associated with different probabilities and magnitudes of reinforcement and punishment, resulting in different overall reinforcement rates. Subsequently, some holes were considered optimal, while others were considered risky. Thus far, we have seen HFD-induced impairment in acquisition of nose-poke training. Moving forward, it is anticipated that the HFD group will increase in risky choice as well as premature responses, a measure of motor impulsivity. Future studies will examine the potential additive effects of traumatic brain injury (TBI) and HFD exposure; an inflammatory diet may exacerbate TBI-induced cognitive deficits.

Neuroscience Poster 10:

Connectivity of a Modulatory Neuron in the Drosophila Antennal Lobe

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Neuromodulators, like serotonin, are released by modulatory neurons to alter other neurons based on the organism's physiological state. In complex systems with massive networks, it is difficult to understand the role of a single serotonergic neuron. However, the "contralaterally projecting, serotonin-immunoreactive deutocerebral neurons" (CSDns) are the only two serotonergic neurons within the olfactory system of the fruitfly, Drosophila. Coates et al 2017, determined that the output of the CSDns is heterogeneous across subregions (glomeruli) within the antennal lobe, an odor processing region. This suggests that the CSDn may modulate certain the processing of some odors differently than others. We aim to systematically reconstruct and identify the synaptic partners of the CSDn across four glomeruli that differ in stimulus tuning and CSDn innervation using an EM dataset of a complete Drosophila brain. We found that the CSDn has output mostly on a neuron class known as local interneurons (LNs), but input was variable across glomeruli. This difference may be dependent on odor tuning, elicited behavior, or another mechanism; however, reconstruction of more partners is required.

Physical Sciences Poster 1:

Improving Parametric Dependence of Exchange Correlation SCAN Functional with Uncertainty Quantification Methods

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Density Functional Theory (DFT) changed condensed matter physics and redefined properties in the quantum realm by making density the paramount variable. One of the most glaring issues in DFT is exact exchange and correlation functionals are unknown. Scientists account for this shortcoming with approximations. Strongly Constrained and Appropriately Normed DFT (SCAN) is an approximation and one of the newest types of meta-GGA DFT exchange correlation functional methods. Compared with previous approaches, SCAN depends on local density, the gradient of density and the Laplacian of the wave functions. SCAN was lauded for accuracy and efficiency, but is prone to miscalculate formation energy, particularly in strongly correlated and magnetic materials. In this work we explore parameter space of the SCAN functional with nonmagnetic, ferromagnetic and anti-ferromagnetic materials using Bayesian Calibration assisted by Markov Chain Monte Carlo (MCMC) calculations. In an attempt to improve SCAN we modify seven parameters that affect the correlation and exchange functionals and try to find the regime where these parameters are able to improve predictions of several properties using over 10 different materials.

Physical Sciences Poster 2:

Forensic Footwear Analysis: Adjusting for Confounding Factors

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Seventy forensic footwear examiners were asked to review 12 paired images involving a known test impression and a questioned impression. Examiners' responses were used to determine relationships between accuracy, conclusion, case and examiner attributes with a chi-square test of independence. Results indicated that examiner accuracy was (i.) independent of previous familiarity with the experimental conclusion scale used in this study (p-value of 0.856), and (ii.) independent of the number of knowns provided in each comparison (p-value of 0.871). Using directed acyclic graphs (DAGs), possible confounding factors were identified, including examiner certification as a possible confounder for accuracy versus scale familiarity, and the experimental inclusion of a known match as a possible confounder in the evaluation of accuracy versus number of knowns provided. To assess the impact of these attributes, the experimental results were stratified and the Mantel-Haenszel test was used to determine an adjusted odds ratio. Results indicate that certification is not a confounder for the chi-square test of independence, however the presence of a known match is a confounder.

Physical Sciences Poster 3:

Demonstration of Semi-permanent Cationic and Anionic Surface Coatings for Capillary Electrophoresis

Alyson K. Fulton*[1,2], Courtney J. Kristoff[1], and Lisa A. Holland[1]
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Capillary electrophoresis is a high efficiency separation driven by an applied electric field. It is well suited for biomolecules, including proteins, as analytes moves through a narrow bore capillary based on charge-to-size ratio. A limitation of protein analyses is nonspecific adsorption to the separation surface which broadens the protein peaks. This can be remediated by altering the capillary surface, which can be done through covalent modification of the surface or by using dynamic coatings that are not reproducible. In this work, new self-assembled cationic and anionic semi-permanent phospholipid-surfactant coatings were created to easily modify the surface and improve separations. The coatings were characterized by measuring the electroosmotic flow with a neutral compound (dimethylmformamide). The stability of the coating was quantified as the migration time precision obtained with replicate runs (n = 10) for cationic, anionic, and neutral molecules separated in background electrolytes with pH values ranging from 4 to 9. The results demonstrate that the new coatings dramatically improve protein separations, are reproducible, cost-effective, and can be applied without covalent modification of the capillary surface.

Physical Sciences Poster 4:

New Methodology To Controlling Regioselectivity Utilizing a Copper-Catalyzed Boracarboxylation

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A methodology to achieve copper-catalyzed regioselective boracarboxylation of vinyl arenes has been reported by the Popp group. This transformation uses the cheap, abundant C1 feedstock of carbon dioxide to access highly functionalized α-aryl carboxylic acid derivatives. Expansion of boracarboxylation to vinyl indole, benzofuran, and benzothiophene substrates has been achieved to provide interesting organic moieties. The derivatization of the boron atom through Suzuki cross-coupling has led to a new method to synthesize 2,3-diarylpropionic acids, which find prevalence in pharmaceuticals. While other routes typically rely on the sterics and electronics of the aryl substituents, this new route allows for control of the regioselectivity of the carboxylic acid.

Physical Sciences Poster 5:

Thiazole Carboxylic Acid for the Investigation of Silver-Promoted Oxidative Decarboxylative Cross-Coupling

Emily Hummell,* Jenny Ng Wu,* Kerry-Ann Green, and Jessica Hoover
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Decarboxylative cross-coupling reactions provide an alternative approach to the traditional routes for the synthesis of biaryl compounds including those containing the thiazole moiety, which have broad applications in the pharmaceutical industry. This approach intends to improve efficiency and produce byproducts that are more environmentally friendly compared to the traditional routes. Despite the importance of this heteroaromatic structural motif, very little is known generally about the decarboxylation of the thiazole carboxylic acid precursors in oxidative decarboxylative cross-coupling reactions. Silver based salts such as Ag2CO3 and AgOAc are some of the more commonly used stoichiometric oxidants for these transformations and this work describes the synthesis and characterization of some thiazole carboxylic acids with the aim of probing silver-mediated decarboxylation. Silver-mediated decarboxylation has the potential to expand the scope of heteroaromatic compounds that can be efficiently synthesized. Three thiazole carboxylic acids were successfully synthesized and characterized by a variety of techniques: 1H and 13C NMR, IR spectroscopy, and melting point analysis.

Physical Sciences Poster 6:

Progress in Suzuki Cross-Coupling of Boracarboxylated Products

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The aryl propionic acid pharmacophore found in many common non steroidal anti inflammatory drugs, such as naproxen and ibuprofen, are also found in 2,3-diaryl propionic acids, making this latter class of compounds interesting from a drug synthesis point of view. Synthetic selectivity is an important consideration when preparing these molecules, and until recently, few methods have been reported that have synthesized these compounds regioselectively. The Popp group has developed the first method to achieve boralative carboxylation of vinyl arenes. This is a mild method that uses redox neutral copper catalysis and one atmosphere of carbon dioxide to access new boron functionalized alpha aryl carboxylic acids as single regioisomer. Through use of Suzuki cross coupling a boracaboxylated product in tandem with aryl halide provides a new methodology to access 2,3-diaryl propionic acid. Here in we report the extension of the Suzuki methodology to access pharmaceutically interesting heteroaromatic containing 2,3-diaryl propionic acids.

Physical Sciences Poster 7:

Development of an Electrochemical Sensor for Buprenorphine Using Screen-Printed Carbon Electrodes

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Treatment, education, and management around opioid addiction is an area of significant interest due to the growing opioid epidemic. A common practice for treating opioid addiction is with the medication buprenorphine. Therefore, monitoring patient adherence to therapy is vital for treatment success, making a rapid and inexpensive way to detect this drug a desirable task. This work demonstrates the initial development of an electrochemical sensor to detect buprenorphine in aqueous media. The proposed method utilizes small, disposable screen-printed carbon electrodes (SPCEs) and square wave voltammetry (SWV), which allows for acceptable limits of detection and fast response time. The buffer, pH, and SWV parameters were optimized to improve current response. A Britton-Robinson buffer of pH 7 was determined to be optimal and calibration curves were run in triplicate over the linear range 2 μg/mL to 15 μg/mL (R^2=0.9917). The limit of detection was calculated from these curves to be 0.78 μg/mL. Reproducibility was evaluated via relative standard deviation, which was 11%. This method exhibits promise in achieving detection of buprenorphine.

Physical Sciences Poster 8:

Nickel-Catalyzed C-H Trifluoromethylation of 8-aminoquinoline Derivatives

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The 8-aminoquinoline scaffold is profoundly versatile, as it is found in many compounds of agricultural or pharmaceutical relevance and is additionally utilized as a ligand or directing group in numerous chemical reactions. Activation and functionalization of its C-H bonds is an emerging area of scientific research, allowing for the synthesis of many natural products and drug candidates from a more common precursor. More specifically, trifluoromethylation is of great interest due to the unique biological activity and metabolic stability the substituent provides. Many previous C-H trifluoromethylation reactions employ palladium or copper catalysts. We wished to explore the potential of using nickel as a catalyst because it is affordable, readily available, and often enables unique reactivity. We report herein, progress on the development of a nickel-catalyzed C-H trifluoromethylation of 8-aminoquinoline benzamides. Under our conditions, trifluoromethylation is occurring at the C-5 position of the quinoline, which has traditionally been difficult to access. Future work will aim to further improve the yield and extend the scope of the reaction.

Physical Sciences Poster 9:

Experimental and Theoretical Studies of CN Radical Reactions in the Gas Phase

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In combustion processes, small free radicals such as the cyano radical (CN) play an important role in the production of polycyclic aromatic hydrocarbons (PAHs), which are precursors to soot. This is of great concern due to known harmful effects of soot on human health and the environment. Rate constants and reaction mechanisms for small free radical reactions provide vital information to improve the accuracy of combustion models. In the laboratory, the CN (X2Î£+) radical is generated from gaseous ICN precursor using pulsed laser photolysis at 266 nm. Rovibronic spectra are recorded using laser induced fluorescence over an excitation wavelength range of 386 to 388 nm at temperatures from 298 to 450 K. These spectra are used to determine the temperature of the gas mixture, in preparation of future kinetics studies of CN radical + 2-methylfuran. A potential energy surface for the reaction of 2-methylfuran was created using CBS-QB3 level of theory to gain insight into the reaction mechanism and products. Substitution of CN onto the molecule, rather than hydrogen abstraction, is likely the dominant pathway.

Physical Sciences Poster 10:

Copper Catalyzed Decarboxylative Heck Reaction of Vinyl Bromides with Electron Deficient Carboxylic Acids

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The Heck-Mizoroki reaction has found wide applications in the construction of C-C bonds. These protocols offer efficient access to a variety of biologically active molecules. The decarboxylative Heck reaction can use carboxylic acids coupling partners in place of the traditional aryl halides. However, these methods usually lack atom economy and rely on precious metals like palladium as the catalyst. Copper can be an attractive catalyst for this type of reaction since itâ€™s a first-row transition metal, highly abundant and low-cost. The combination of a copper catalyst and readily accessible carboxylic acid coupling partners makes this reaction of high interest in synthetic chemistry. This work will focus on the methodology development of a copper catalyzed decarboxylative Heck reaction between electron deficient benzoic acids and vinyl bromides. Currently, catalyst, temperature and bases have been screened. Future work will focus on increasing the yield of the reaction by evaluating the ligands, solvents and additives.

Physical Sciences Poster 11:

Nickel Catalyzed C-H Trifluoromethylation of N-8-quinolinylbenzamide

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Trifluoromethyl arenes are important substructures in a variety of pharmaceuticals and agrochemicals, and are widely praised for their biological activity and metabolic stability. Traditional methods to access trifluoromethyl arenes often involve fluorination of a trichloromethyl group and require expensive or toxic fluoronating reagents. In contrast, the direct trifluoromethylation of arene C-H bonds has gained attention as a convenient and atom-economical method of accessing these structures. We recently identified a new Ni-catalyzed direct C-H trifluoromethylation reaction of N-8-quinolinylbenzamide using 5-(trifluoromethyl)-dibenzothiophenium as the CF3 source. After screening multiple reaction variables, it was determined that the set of optimized conditions do not produce the expected trifluoromethyl arene, but instead produce a trifluoromethyl quinoline product with trifluoromethylation occurring at the C-5 position. The C-5 quinoline product was collected in 46% yields. The reaction discovery, development, and a brief summary of the reaction scope will be discussed as well as alternative CF3 sources planned for future study.

Physical Sciences Poster 12:

Silver-mediated Decarboxylation of Thiazole Carboxylic Acids with Relevance to Oxidative Decarboxylative Coupling Reactions

Jenny Ng Wu,* Kerry-Ann Green, and Jessica M. Hoover
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Oxidative decarboxylative coupling reactions offer an attractive synthetic route for accessing functionalized compounds from simple and readily available carboxylic acid substrates, including heteroaromatic acids. Many of these oxidative decarboxylative synthetic routes involve the use of silver-based oxidants, such as silver oxide and silver nitrate, which are also believed to facilitate the key decarboxylation step in the cross-coupling reaction. Studies into the silver-mediated decarboxylation of heteroarenes in general are very limited relative to their benzoic acid counterparts, however thiazole-based compounds are some of the most important building blocks for biologically and pharmaceutically significant compounds. This work seeks to gain insight into the silver-mediated decarboxylation of some thiazole carboxylic acids in order to better understand the reaction mechanism. Here, we report the synthesis of a series of thiazole carboxylic acids and their characterization by 1H NMR, 13C NMR, and IR spectroscopies. A preliminary investigation into the synthesis of silver carboxylate complexes, along with the silver-mediated decarboxylation of selected acids is discussed.

Physical Sciences Poster 13:

Several Problems Related to Tiling on Bracelets

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Tiling the integers is the process of selecting translates of some subset of integers S, such that each integer is contained in exactly one of these translates. In this context, a translate of a set S would be denoted S+t, and represents the set of all s+t such that s is an element of S. In our research, we have explored multiple problems related to tiling the integers modulo n with translates of a finite set. In particular, we are attempting to characterize the polychromatic number of sets of size four on the integers mod n, to develop modular analogs for tiling characterizations created by D. Newman, E. Coven and A. Meyerowitz, and to investigate the Coven-Meyerowitz Conjecture for the non-square-free case. A careful analysis of Newman's technique gives a characterization for tiling on Zn with sets of prime power size. This also characterizes when sets of size four have polychromatic number four.

Physical Sciences Poster 14:

Morphological modification of parylene-c by varying pressure in vapor deposited thin films

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Parylene-c is a transparent, insulating, and biocompatible polymer that is commonly used in implantable device encapsulations and various biomedical applications such as lab-on-a-chip. Since this polymer is highly adaptable and conformal, many have investigated the various uses to increase its biocompatibility and prolong the lifetime of parylene-c coated devices. In our study we controlled the deposition pressure and flux shape during the time the parylene-c dimer was vaporized and deposited on the silicon wafer in order to create a diverse surface morphology and void micro/nano-structure. The results revealed that under elevated pressures, the porosity and distribution of the material on the substrate becomes more clustered together by the scanning electron microscopy (SEM). At pressures of 35 mTorr, 55 mTorr, 75 mTorr and 100 mTorr, the average surface roughness of the films increased each time by the atomic force microscopy (AFM). The study is significant for it expands the knowledge to tune the optical, mechanical and biological properties of parylene-c and aids in the development of improved implantable devices for patients in need.

Physical Sciences Poster 15:

Forensic Analysis of Gunshot Residue Using Analytical Electrochemistry and Gas Chromatography-Mass Spectrometry

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Gunshot residue (GSR) chemical analysis plays a vital role in pursuing the identification of a potential shooter involved in violent crime. However, valuable investigative leads can be lost due to lengthy analysis times required during the testing of these materials through utilizing the currently accepted scanning electron microscope (SEM) method. As a supplemental technique, electrochemistry is presented in this study as an alternative to improve analysis times from weeks to within minutes, allowing detection of both organic and inorganic GSR that can be implemented in the field. Amperometric treatment followed by square-wave voltammetry (SWV) was used for the assessment of inorganic GSR (lead, antimony, and copper) and organic GSR (nitroglycerin, 2,4-dinitrotoluene, diphenylamine, methyl centralite, and ethyl centralite) on screen-printed carbon electrodes (SPCEs). Additionally, Gas Chromatography-Mass Spectrometry (GC-MS) was used to analyze two standard ammunitions (TulAmmo and Winchester) and four nonstandard ammunitions (Fiocchi, CCI, Syntech, and Inceptor). Analysis of these ammunitions, along with shot clothing samples, was performed to determine the identity of compounds present in nonstandard ammunition that could interfere with the Griess test.

Physical Sciences Poster 16:

Identifying the Sources of Variance of Ion Abundances of GC-EI-MS Measurements

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In the field of forensic chemistry gas chromatography-mass spectrometry (GC-MS) is the gold standard for seized drug identification. The process involves the comparison of a questioned sample with a database or a certified reference material. However, sources of variance exist that affect the ion abundances making it difficult to compare the questioned sample with a database or contemporaneously analyzed standards. The aim of this project is to identify the sources of variance affecting both the comparison of samples analyzed at different laboratories and the repeated measures within a single laboratory as well as assess the magnitude of variance for each source. Differences in the ion source temperature and column flow rate were identified as the major sources of variance of ion abundances between methods, whereas fluctuations in the high vacuum pressure strongly influence the variation in the ion abundances within repeated measurements. Our hope is to combine this added knowledge with our novel algorithm for the comparison of mass spectra developed in the Jackson Group to further advance the seized drug identification process.

Physical Sciences Poster 17:

Zirconium Compounds as Earth-Abundant Alternatives for Precious Metal Photosensitizers

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Photoluminescent precious metal compounds called photosensitizers are often used in solar fuel production, photovoltaic devices, and photocatalysis. Precious metals, while used to make historically effective photosensitizers, are rare, expensive, and often toxic. In contrast, zirconium is the fourth most abundant transition metal, meaning it is significantly cheaper to use to make analogous compounds that are considered to be less toxic. The lower price point means that more people, industries, and institutions could readily perform photochemistry at lower cost. Photoluminescent zirconium compounds are made by coordinating organic molecules, called ligands, that are electron-rich to the electron-poor zirconium center, resulting in a donation process called ligand-to-metal charge transfer. In this specific study, a new acridine diamine ligand ($H_2{}^{Tol}ADA$) and its associated zirconium compound ($Zr(^{Tol}ADA)_2$) are synthesized to probe the effects of ligand structure on photoluminescence. This was achieved by combining features of two previously studied ligands: one that makes a photoluminescent compound and one that makes a nonluminescent compound.

Physical Sciences Poster 18:

Development of a Copper-Catalyzed Decarboxylative Heck Reaction

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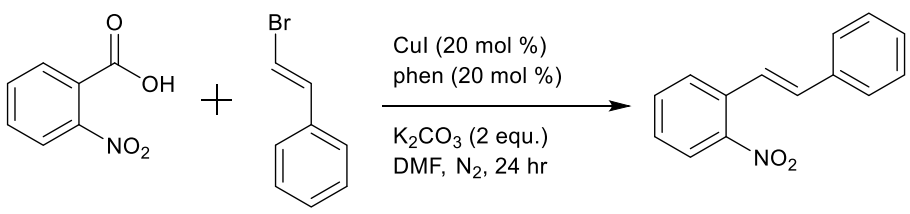
The widely studied Heck reaction is an important reaction in organic synthesis because it forms a new carbon-carbon bond from an alkene and an organohalide, using a palladium catalyst. Benzoic acids can be used in place of organohalides in the Heck reaction, making this reaction decarboxylative. This new substrate option widens the application of Heck reactions and reduces byproduct formation. The goal of this research is to find a copper catalyst that can be used in place of palladium in the decarboxylative Heck reaction. Using a copper catalyst would be an improvement because copper is less expensive and toxic than palladium and because a copper catalyst allows for new reactivity patterns in this decarboxylative cross-coupling reaction. In these experiments, a decarboxylative Heck reaction using 2-nitrobenzene and Î²-bromostyrene was performed to produce 2-nitrostilbene. This research shows that a copper(I) iodide catalyst paired with a phenanthroline ligand is capable of forming the desired styrene product.



Physical Sciences Poster 19:

Investigating the Selective Microwave Heating on the 1,2-Meisenheimer Rearrangement and Sakurai Reaction

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Microwave reactors are devices commonly used in organic synthesis. Some microwave reactions, when directly compared with conventionally heated reactions, can have higher apparent reaction rates as well as other effects. Why the effects occur is poorly understood. The Dudley group hypothesizes that the microwave reactions are selectively heating the more microwave absorbing solutes rather than poorly absorbing solvent. Selective heating of the solutes causes localized heating, which perturbs a thermal equilibrium. The specialized interactions with microwaves by solutes instead of convective heating from the solvent are what differ the microwave from conventional heating. To test the hypothesis, systems utilizing a microwave absorbing solute and a relatively non microwave absorbing solvent were developed. Firstly, the Meisenheimer rearrangement, where heating of an amine N-oxide causes rearrangement into an alkoxy amine and secondly the Sakurai reaction uses an allyl silicate to allylate an aldehyde, creating a carbon-carbon bond. These systems will allow us to compare kinetics of conventional heating versus selective microwave heating and help improve our understanding of microwave heating.

Social & Behavioral Sciences Poster 1:

An evaluation of free-listing as a method to identify cultural perceptions of cancer

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This research seeks to explore cultural perceptions and knowledge about cancer among a college-going and college-educated population in central Appalachia using the ethnographic method of free-listing. Prior studies have indicated cultural factors may explain above average rates of cancer in central Appalachia. While cultural factors are often used to explain cancer rates in this region, few studies provide ethnographic data to support such claims. Even fewer seek to examine the diversity of cultural perspectives and knowledge of cancer within the central Appalachia region. This study was designed to accomplish two goals: (1) to determine explanatory models of cancer and cancer care among a college-going/college-educated population (a rarely studied group within the Appalachian region) and (2) to evaluate the efficacy of free listing as a method for eliciting cultural perceptions of cancer and cancer care. Previous research has demonstrated free-listing as a useful method for eliciting cultural domains and shared cultural knowledge. Despite some limitations, the free-listing method has proven useful in eliciting cultural perceptions of cancer and cancer care among a college-educated/college-going population.

Social & Behavioral Sciences Poster 2:

Mindful and Happy with Life: The Roles of Self-esteem and Perceived Stress

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Mindfulness, or attention and awareness to one's experiences as they occur, has been associated with a number of positive outcomes, such as life satisfaction. However, it is unclear why mindfulness would increase satisfaction with life. Some researchers have argued that mindfulness increases self-esteem, and others have suggested that mindfulness reduces stress. Both of which may improve life satisfaction. This study tested self-esteem and perceived stress as mediators, or pathways, to explain the relation between mindfulness and life satisfaction. Participants completed the Mindful Attention Awareness Scale, Life Satisfaction Scale, Perceived Stress Scale, and Rosenberg Self-Esteem Scale in two studies (Ns = 261 & 300). Greater mindfulness was associated with more positive self-esteem and less perceived stress, which were associated with greater life satisfaction. Thus, both self-esteem and perceived stress explained the relation between mindfulness and life satisfaction. This implies that mindfulness-based interventions may work through self-esteem and perceived stress.

Social & Behavioral Sciences Poster 3:

Spirituality Linked to Better Psychological Well-Being in African Americans

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Spirituality has been linked to better psychological well-being in African Americans. However, the mechanism by which spirituality confers these benefits is unknown. Individuals who are higher in spirituality report greater social support, and social support has been associated with better psychological well-being. The present study tested the extent to which perceived social support explained the link between spirituality and psychological health (i.e., anxiety and depression) in a sample of African American individuals. Participants (N = 179) completed an online survey. Those who were higher in spirituality perceived greater social support from their friends, significant other, and family. They also reported less anxiety and depression, but social support explained this link between spirituality and psychological well-being. Thus, some of the psychological benefits seen from spirituality may be due to improvements in perceived social support. These findings have implications for the use of practices that enhance spirituality in a counseling setting to achieve better psychological well-being.

Social & Behavioral Sciences Poster 4:

Omitting Reinforcers Decreases the Efficacy of Noncontingent Reinforcement

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Noncontingent reinforcement (NCR), which involves the delivery of reinforcers independently of responding, significantly decreases challenging behavior when implemented consistently. Less is known about the effects of inconsistent implementation, although these inconsistencies are common. We evaluated effects of omitting 20% or 80% of scheduled NCR reinforcers on the likelihood of disruptive behavior (DB) for two children who engaged challenging behavior maintained by access to items. For both participants, DB occurred more than once per minute on average before treatment. Consistent NCR reduced the frequency of DB by at least 75% of baseline. In comparison, omission of 80% of scheduled reinforcers during NCR resulted in complete relapse for one participant and reduction of treatment effect to only 28% of baseline for the other participant. Omitting 20% of scheduled reinforcers resulted in similar treatment effects to consistent implementation, suggesting that there may be some critical level of consistency needed for positive treatment outcomes.

Social & Behavioral Sciences Poster 5:

How Awesome Is Your Life?

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Awe, the experience of feeling small in the presence of something exceptional, and other positive constructs like gratitude are related to an individual's overall psychological and physical well-being. Certain factors, like age, can influence the experience as well as the effects of awe. The purpose of this study is to determine how awe and gratitude combine to influence life satisfaction and whether age moderates these associations. Data came from 81 adults that completed a series of experience sampling surveys over a period of three years. We found that awe and gratitude at Time 1 predicted life satisfaction one year later. Furthermore, higher gratitude amplified the effect of awe on life satisfaction in younger individuals but reduced its effect in late middle-aged and older adults. Thus, age moderates the effects of awe on life satisfaction. These results are discussed in the context of potential interventions for adults, and future research is suggested.

Social & Behavioral Sciences Poster 6:

Examining the Link Between Mindfulness and Prejudice: The Role of Social Dominance Orientation

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Finding techniques to reduce prejudice has preoccupied social and clinical psychologists for the past half century. Scholars have proposed that greater mindfulness (e.g., nonjudgmental awareness of the present) may be related to lesser prejudice, but studies have been inconclusive, making existing research sparse and contradictory. Thus, the current study sought to determine if mindfulness was associated with prejudice towards the LGBT community, and if social dominance orientation (SDO; e.g., the extent to which one endorses social hierarchy and inequality) mediated that relationship. Participants included 259 community members, who completed an online survey that assessed mindfulness, social dominance orientation, and prejudice toward LGBT groups. Individuals who reported greater scores in mindfulness endorsed lower levels of social dominance orientation and lower levels of prejudice. Moreover, there was a significant indirect effect of mindfulness on prejudice through social dominance orientation. Potentially, mindfulness reduces support of inequality, which in turn lowers levels of prejudice towards LGBT members. Future research should explore whether implementing mindfulness practices and training is an effective means of reducing prejudice.

Social & Behavioral Sciences Poster 7:

Associations between Parental Attachment, Delaying Gratification, and Substance Use in Adolescents

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Delay of gratification is the ability to put off having a small reward instantly to receive a greater reward later. Previous studies suggest that forming a secure attachment with one's parent(s) can have many protective effects for developing children and adolescents. Because substance use is prevalent in adolescents, there is still a need to better identify predictors of use such as delay of gratification and attachment. Therefore, this study examines the roles of parental attachment (anxious or avoidant) and adolescents' ability to delay gratification in relation to their substance use. Participants were approximately 347 ninth graders, who completed questionnaires regarding parental attachment, delay of gratification, and substance use, among other variables. It is hypothesized that adolescents who are more insecurely attached (e.g., higher on anxious or avoidant attachment) to a parent and who have less ability to delay gratification will engage in more substance use. Moderation effects will also be explored to determine if having multiple risk factors (more insecure attachment and lower delay of gratification) further increases adolescents' risk of substance use.

Social & Behavioral Sciences Poster 8:

Longitudinal Patterns of Teacher, Parent, and Peer Social Support During Adolescence

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Higher levels of social support have been consistently linked with a wide range of positive outcomes during adolescence. Support is a key component in Self-Determination Theory, which explores motivation and development. Autonomy, competence, and relatedness are the three basic human needs described by the theory that are mainly impacted by one's environment. Adolescents' social support comes from a variety of sources including parents, teachers, and peers. Previous research suggests differences in levels of support based on age and gender of adolescents. The current study uses longitudinal data to explore trends in perceived support from teachers, parents, and peers across early and middle adolescence. Observations were gathered from a survey administered to students that included support measures based on Self-Determination Theory. Based on these measures, it is predicted that peer support will increase overtime, while parent and teacher support will decline as individuals assume more independence. Gender differences are also expected to be found across the support systems. As the data was collected from a diverse sample, potential variance in perceived social support across race/ethnicity is anticipated.

Social & Behavioral Sciences Poster 9:

From Status and Trust to the Allocation of Positive and Negative Rewards

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Recent sociological research on status and trust shows a link between social status and perceptions of trustworthiness: Those with higher social status are perceived to be more trustworthy. The current study seeks to highlight the implications of higher or lower perceptions of trustworthiness and how they affect social interaction. Using status characteristics and reward expectations theories, we propose a theoretical mechanism linking status and perceptions of trustworthiness to the allocation of positive and negative rewards. We test our hypotheses in an experimental study using instances of corporate malfeasance and propriety. Vignettes depict either accountants (low status) or chief financial officers (high status) engaging in or reporting instances of financial statement fraud. Experimental participants are asked to allocate positive rewards (i.e., bonuses) to those who report financial statement fraud but are asked to allocate negative rewards (i.e., monetary/prison sanctions) to those who commit it. Our analyses determine whether the effects of status (high/low) and trustworthiness (high/low) on reward allocation vary depending on the type of allocation (positive/negative).