20th Annual UNDERGRADUATE RESEARCH DAY at the Capitol

University of Charleston

West Virginia University

1891 West Virginia State University

Marshall

35 WV STaR Division

Science, Technology & Research

February 10, 2023

Dear Participant,

Welcome to this year's Undergraduate Research Day at the Capitol! We are excited to hear about the important research being done at higher education institutions by undergraduates across the state, and look forward to the invaluable networking of students, faculty mentors, and legislators that helps us all learn about the benefits of scientific research to the well-being of West Virginians and the economy of our state. The Division of Science, Technology and Research (STaR) within the Higher Education Policy Commission is honored to serve as a sponsor of the event.

West Virginia has a long history of research excellence and innovation. This year we are excited to present three Research Challenge Grant awards at URDC. These $1.3 million grants, supported by the state Research Challenge Fund, are awarded every five years and support the creation of university-based research centers that foster economic development and workforce advancement. Prior awards have shown a significant return on investment in the form of follow-on funding from federal and corporate sources that support research by undergraduates, graduate students and faculty at our higher education institutions.

At Undergraduate Research Day each year, we celebrate the impressive and growing contributions of undergraduates to scientific research and West Virginia's future economy. We are so proud of your achievements and look forward to hearing what makes you so passionate about your work, and how you hope to impact the citizens of our state for years to come.

Sincerely,

Juliana Serafin, PhD
Senior Director
STaR Division: Science, Technology and Research
West Virginia Higher Education Policy Commission

I. PARTICIPANTS BY SENATE DISTRICT (first authors only as provided by participants)

Senate #	Participant		Poster #
1	Lillian	Bischof	81
2	Tyler	Giorcelli	108
	Kasey	Blankenship	79
	Leah	Thomas	91
	Madison	Lindung	92
	Alyssa	Carpenter	115
	Alexander	Flasch	69
	Kelsey	Razvillas	88
	Grace	Udah	118
	Riley	Klug	3
	Jack	Evans	17
	Madison	Mann	54
	Abigail	Clasgens	85
	Cooper	Motzko	86
	Nikki	Vilasuso	89
	Kallie	Schafner	120
	Chaysee	Putnam	6
	Haidyn	DePinho	123
3	Brianna	Higgins	43
	Maggie	Robertson	20
	Ryan	Wager	31
	George	Harris	57
	Emily	Dugan	14
	Kayla	Clark	60
4	Emma	Barrett	26
	Joshua	Conrad	29
	Joseph	Harrah	78
	Joshua	Lovejoy	66
	Layne	Assif	110
	Alyssa	Mize	70
	Sarah	Joyce	126
5	Jacob	Dial	52
	Gabriella	Hill	16
	Kate	Perkins	19
	Smara	Sigdel	33
	Dustin	Darnell	104
	Rileigh	Elk	107
	Alan	Messinger	109
	Hunter	Copley	105

	Miranda	Simpson	47
	Khaled	El-Shazly	39
	Brettina	Jeffers	103
	Nicole	Adkins	48
	Claire	Fulks	73
	Alexa	Hoffman	68
	Andrew	Ball	71
	Neil	Loftus	127
6	Megan	Kline	40
	Seth	Jude	32
	Chloe	Duckworth	24
	Ciersten	Rose	124
7	Myrisha	Haney	21
	Hannah	Duba	59
	Hannah	Duba	60
8	Dakota	Walker	44
	Karlie	Hill	64
	Dylan	Prasad	101
	Sullivan	Steele	50
	Tessa	Gardner	34
	Kaitlyn	Legg	121
9	Noah	Quesenberry	49
	Makayla	Anderson	90
	Eugenia	Marcelli	27
	Pau	Eslava	83
	Kelly	Mills	38
	Emily	Henry	37
	Caleb	Roark	112
	Jason	Constable	77
	Brandi	Blake	122
10	Elena	Maddy	51
	Zachary	Ellis	9
	Courtney	Smith	125
11	Olivia	Carpenter	22
	Kennedi	Lewellyn	98
	Lindsay	Maxwell	53
12	Emily	Herron	102
	Abbey	Clark	42
	Ashley	McCullough	72
	Timothy	Reidell	55
13	Amara	Mason	111
	Maria	Rincon Perez	82
	Abigail	Tillema	96
	Isabella	Crouch	119

	Victoria	Nist	2
	Tylor	Yost	1
	Manar	Hesino	4
	Egon	Mamboleo	25
	Haley	Liu	58
	Daniel	McDonald	74
	Ha	Tran	76
	Rachel	Phillips	84
	Ethan	Harner	95
	Emma	Swiger	97
	Anushka	Pathak	100
	Miles	Bowlin	106
	Rebekah	Gooding	5
	Jordan	Stewart	93
	Ella	Moats	8
14	Teagan	Kuzniar	65
15	Chyanne	Reid	7
	Bryan	Ho	35
16	Hannah	Vitalos	45
	Kailey	Cullen	62
	Justice	Duvall	61
	Davis	Funk	99
17	Darshan	Sangani	36
	Rachel	Morris	23
	Isabella	Gharib	28
	Savannah	Lahey	63
	Kimberly	Keefer	113
	Amartya	Das	11
	Joshua	Maddy	46
	Laura	Ransom	80
	Emily	Hissom	15
	Ameris	Chadband	12
	Eden	Hodges	87
	Timothy	Wise	114
	Desirae	Ledesma	13
	Ethan	Boddy	117
	Emelina	Alvarez	116
	Tyler	Walker	41
	Jafet	Rivera Hernandez	18

II. PARTICIPANTS BY HOUSE DISTRICT (first authors only as provided by participants)

House #	Participant		Poster #
1	Tyler	Giorcelli	108
	Kasey	Blankenship	79
	Leah	Thomas	91
	Madison	Lindung	92
2	Alyssa	Carpenter	115
	Alexander	Flasch	69
	Brianna	Higgins	43
	Emma	Barrett	26
	Amara	Mason	111
	Maria	Rincon Perez	82
	Chyanne	Reid	7
3	Lillian	Bischof	81
	Kelsey	Razvillas	88
	Jacob	Dial	52
4	Grace	Udah	118
5	Riley	Klug	3
6	Megan	Kline	40
7	Maggie	Robertson	20
	Haidyn	DePinho	123
8	Ryan	Wager	31
	George	Harris	57
10	Emily	Dugan	14
	Kayla	Clark	60
11	Olivia	Carpenter	22
12	Joshua	Conrad	29
	Joseph	Harrah	78
13	Dakota	Walker	44
	Karlie	Hill	64
15	Joshua	Lovejoy	66
	Layne	Assif	110
16	Gabriella	Hill	16
	Kate	Perkins	19
	Smara	Sigdel	33
	Dustin	Darnell	104
	Rileigh	Elk	107
	Alan	Messinger	109
	Hunter	Copley	105
	Miranda	Simpson	47
17	Khaled	El-Shazly	39
	Brettina	Jeffers	103

	Dylan	Prasad	101
	Neil	Loftus	127
18	Nicole	Adkins	48
	Claire	Fulks	73
21	Alyssa	Mize	70
	Seth	Jude	32
23	Myrisha	Haney	21
24	Alexa	Hoffman	68
	Hannah	Duba	59
	Hannah	Duba	60
25	Noah	Quesenberry	49
27	Makayla	Anderson	90
	Eugenia	Marcelli	27
	Pau	Eslava	83
	Ciersten	Rose	124
28	Andrew	Ball	71
	Elena	Maddy	51
29	Kelly	Mills	38
	Brandi	Blake	122
30	Emily	Henry	37
	Darshan	Sangani	36
32	Courtney	Smith	125
35	Rachel	Morris	23
	Isabella	Gharib	28
	Savannah	Lahey	63
	Kimberly	Keefer	113
	Amartya	Das	11
	Joshua	Maddy	46
	Laura	Ransom	80
36	Emily	Hissom	15
	Ameris	Chadband	12
	Eden	Hodges	87
	Timothy	Wise	114
37	Sullivan	Steele	50
	Tessa	Gardner	34
	Desirae	Ledesma	13
	Ethan	Boddy	117
	Emelina	Alvarez	116
	Tyler	Walker	41
	Jafet	Rivera Hernandez	18
38	Sarah	Joyce	126
39	Kaitlyn	Legg	121
41	Chloe	Duckworth	24
42	Zachary	Ellis	9

45	Caleb	Roark	112
	Kennedi	Lewellyn	98
46	Emily	Herron	102
48	Abbey	Clark	42
	Ashley	McCullough	72
	Timothy	Reidell	55
49	Teagan	Kuzniar	65
50	Abigail	Tillema	96
51	Jack	Evans	17
	Madison	Mann	54
	Abigail	Clasgens	85
	Cooper	Motzko	86
	Nikki	Vilasuso	89
	Kallie	Schafner	120
	Isabella	Crouch	119
	Victoria	Nist	2
	Tylor	Yost	1
	Manar	Hesino	4
	Egon	Mamboleo	25
	Haley	Liu	58
	Daniel	McDonald	74
	Ha	Tran	76
	Rachel	Phillips	84
	Ethan	Harner	95
	Emma	Swiger	97
	Anushka	Pathak	100
	Miles	Bowlin	106
	Rebekah	Gooding	5
	Jordan	Stewart	93
60	Hannah	Vitalos	45
63	Kailey	Cullen	62
65	Jason	Constable	77
66	Justice	Duvall	61
67	Lindsay	Maxwell	53
76	Chaysee	Putnam	6
78	Ella	Moats	8
93	Bryan	Ho	35
	Davis	Funk	99

III. OUT-OF-STATE PARTICIPANTS (first authors only as provided by participants)

State	Participant		Poster #
IL	Raegan	Halley	30
OH	Amirah	Mitchell	10
	Luke	Chaddock	94
PA	Lauren	Imler	67
	Dean	Sweeney	75
PA	Rachael	Hubert	128
VT	Alice	Salter-Roy	56

IV. PARTICIPANTS BY FIELD (first authors only)

Agriculture			Poster #
	Tylor	Yost	1
	Victoria	Nist	2
Anthropology			Poster #
	Riley	Klug	3
Arabic Studies			Poster #
	Manar	Hesino	4
Art History			Poster #
	Rebekah	Gooding	5
Biochemistry			Poster #
	Chaysee	Putnam	6
	Chyanne	Reid	7
	Ella	Moats	8
	Zachary	Ellis	9
Bioinformatics			Poster #
	Amirah	Mitchell	10
Biology			Poster #
	Amartya	Das	11
	Ameris	Chadband	12
	Desirae	Ledesma	13
	Emily	Dugan	14
	Emily	Hissom	15
	Gabriella	Hill	16
	Jack	Evans	17
	Jafet	Rivera Hernandez	18
	Kate	Perkins	19

	Maggie	Robertson	20
	Myrisha	Haney	21
	Olivia	Carpenter	22
	Rachel	Morris	23
	Rachael	Hubert	128

Biomedical			Poster #
	Chloe	Duckworth	24
	Egon	Mamboleo	25
	Emma	Barrett	26
	Eugenia	Marcelli	27
	Isabella	Gharib	28
	Joshua	Conrad	29
	Raegan	Halley	30
	Ryan	Wager	31
	Seth	Jude	32
	Smara	Sigdel	33
	Tessa	Gardner	34
	Kaitlyn	Legg	121

Chemistry			Poster #
	Bryan	Ho	35
	Darshan	Sangani	36
	Emily	Henry	37
	Kelly	Mills	38
	Khaled	El-Shazly	39
	Megan	Kline	40
	Tyler	Walker	41
	Ciersten	Rose	124

Community Health			Poster #
	Abbey	Clark	42

Computer Science			Poster #
	Brianna	Higgins	43
	Dakota	Walker	44
	Hannah	Vitalos	45
	Joshua	Maddy	46
	Miranda	Simpson	47
	Nicole	Adkins	48
	Noah	Quesenberry	49
	Sullivan	Steele	50
	Neil	Loftus	127

Creative Arts	Poster #

	Elena	Maddy	51
	Jacob	Dial	52
Criminal Justice			Poster #
	Lindsay	Maxwell	53
	Madison	Mann	54
	Timothy	Reidell	55
Dental Hygiene			Poster #
	Alice	Salter-Roy	56
	George	Harris	57
	Haley	Liu	58
	Hannah	Duba	59
	Kayla	Clark	60
	Justice	Duvall	61
	Kailey	Cullen	62
	Savannah	Lahey	63
Ecology			Poster #
	Karlie	Hill	64
	Teagan	Kuzniar	65
Education			Poster #
	Joshua	Lovejoy	66
	Lauren	Imler	67
Engineering			Poster #
	Alexa	Hoffman	68
	Alexander	Flasch	69
	Alyssa	Mize	70
	Andrew	Ball	71
	Ashley	McCullough	72
	Claire	Fulks	73
	Daniel	McDonald	74
	Dean	Sweeney	75
	Ha	Tran	76
	Jason	Constable	77
	Joseph	Harrah	78
	Kasey	Blankenship	79
	Laura	Ransom	80
	Lillian	Bischof	81
	Maria	Rincon Perez	82
	Pau	Eslava	83
	Rachel	Phillips	84

Environmental Studies			Poster #
	Abigail	Clasgens	85
	Cooper	Motzko	86
	Eden	Hodges	87
	Kelsey	Razvillas	88
	Nikki	Vilasuso	89
Exercise Science			
	Makayla	Anderson	90
Forensic Science			
	Leah	Thomas	91
	Madison	Lindung	92
Forestry			
	Jordan	Stewart	93
	Luke	Chaddock	94
Geography			
	Ethan	Harner	95
	Haidyn	DePinho	123
History			
	Brandi	Blake	122
Immunology and Medical Microbiology			Poster #
	Abigail	Tillema	96
	Emma	Swiger	97
	Kennedi	Lewellyn	98
Mathematics			Poster #
	Davis	Funk	99
Medical Research			Poster #
	Anushka	Pathak	100
Neuroscience			Poster #
	Dylan	Prasad	101
	Emily	Herron	102
Physical Activity and Sport Sciences			Poster #
	Brettina	Jeffers	103
	Dustin	Darnell	104
	Hunter	Copley	105
	Miles	Bowlin	106

	Rileigh	Elk	107
	Tyler	Giorcelli	108

Physics			Poster #
	Alan	Messinger	109

Physiology			Poster #
	Layne	Assif	110

Political Science			Poster #
	Amara	Mason	111
	Caleb	Roark	112
	Kimberly	Keefer	113
	Timothy	Wise	114

Psychology			Poster #
	Alyssa	Carpenter	115
	Emelina	Alvarez	116
	Ethan	Boddy	117
	Grace	Udah	118
	Isabella	Crouch	119
	Sarah	Joyce	126
	Courtney	Smith	125

Toxicology, Physiology & Pharmacology			Poster #
	Kallie	Schafner	120

V. PARTICIPANTS BY INSTITUTION (first authors only)

Concord University			Poster #
	Brandi	Blake	122
	Haidyn	DePinho	123
	Ciersten	Rose	124
	Courtney	Smith	125

Marshall University			Poster #
	Kate	Perkins	19
	Emma	Barrett	26
	Joshua	Conrad	29
	Smara	Sigdel	33
	Seth	Jude	32
	Isabella	Gharib	28
	Tessa	Gardner	34
	Chloe	Duckworth	24
	Raegan	Halley	30

Khaled	El-Shazly	39
Darshan	Sangani	36
Miranda	Simpson	47
Nicole	Adkins	48
Joshua	Maddy	46
Hannah	Vitalos	45
Claire	Fulks	73
Alexa	Hoffman	68
Andrew	Ball	71
Dustin	Darnell	104
Rileigh	Elk	107
Hunter	Copley	105
Brettina	Jeffers	103
Alan	Messinger	109
Layne	Assif	110
Kaitlyn	Legg	121
Neil	Loftus	127
Potomac State College		Poster #
Megan	Kline	40
Shepherd University		Poster #
Sullivan	Steele	50
University of Charleston		Poster #
Emelina	Alvarez	116
Gabriella	Hill	16
Emily	Hissom	15
Brianna	Higgins	43
Dylan	Prasad	101
Amara	Mason	111
Kimberly	Keefer	113
Timothy	Wise	114
Sarah	Joyce	126
West Virginia State University		Poster #
Myrisha	Haney	21
Amartya	Das	11
Ameris	Chadband	12
Desirae	Ledesma	13
Jafet	Rivera Hernandez	18
Tyler	Walker	41
Dakota	Walker	44
Karlie	Hill	64
Joshua	Lovejoy	66
Eden	Hodges	87
West Virginia University		Poster #
George	Harris	57

Hannah	Duba	59
Kayla	Clark	60
Savannah	Lahey	63
Haley	Liu	58
Kailey	Cullen	62
Alice	Salter-Roy	56
Victoria	Nist	2
Tylor	Yost	1
Riley	Klug	3
Manar	Hesino	4
Rebekah	Gooding	5
Chyanne	Reid	7
Zachary	Ellis	9
Chaysee	Putnam	6
Ella	Moats	8
Amirah	Mitchell	10
Maggie	Robertson	20
Emily	Dugan	14
Rachel	Morris	23
Jack	Evans	17
Ryan	Wager	31
Egon	Mamboleo	25
Bryan	Ho	35
Abbey	Clark	42
Jacob	Dial	52
Elena	Maddy	51
Timothy	Reidell	55
Madison	Mann	54
Lindsay	Maxwell	53
Justice	Duvall	61
Teagan	Kuzniar	65
Lauren	Imler	67
Kasey	Blankenship	79
Alexander	Flasch	69
Maria	Rincon Perez	82
Lillian	Bischof	81
Joseph	Harrah	78
Alyssa	Mize	70
Laura	Ransom	80
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Daniel	McDonald	74
Ha	Tran	76
Rachel	Phillips	84
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Kelsey	Razvillas	88
Abigail	Clasgens	85
Cooper	Motzko	86
Nikki	Vilasuso	89
Makayla	Anderson	90
Leah	Thomas	91
Madison	Lindung	92
Jordan	Stewart	93
Luke	Chaddock	94
Ethan	Harner	95
Kennedi	Lewellyn	98
Abigail	Tillema	96
Emma	Swiger	97
Davis	Funk	99
Anushka	Pathak	100
Emily	Herron	102
Tyler	Giorcelli	108
Caleb	Roark	112
Alyssa	Carpenter	115
Grace	Udah	118
Ethan	Boddy	117
Isabella	Crouch	119
Kallie	Schafner	120
Rachael	Hubert	128

West Virginia University Institute of Technology		
Eugenia	Marcelli	27
Kelly	Mills	38
Emily	Henry	37
Noah	Quesenberry	49
Pau	Eslava	83
Jason	Constable	77
Miles	Bowlin	106

West Virginia Wesleyan College		Poster #
Olivia	Carpenter	22

1. Individual water use effieciency in beef cattle

Tylor Yost (Morgantown, WV)

Institution: West Virginia University
Field: Other (Agriculture)
Faculty Advisor: Matthew Wilson

Public opinion has focused on animal agriculture being in competition with a growing urban population for land and water resources. Improving water use efficiency is critical for the sustainability of animal agriculture. Our objectives were to understand the magnitude of variation in water use efficiency and compare that to feed efficiency, as measured by residual feed intake (RFI). Our study utilized yearling bulls, steers, and heifers (n=745) between the summer of 2019 and the summer of 2021. Individual feed and water intakes were determined using a real-time feed intake system and an In Pen Weighing system (IPW). Water use efficiency, residual water intake (RWI), was calculated similarly to RFI where an expected water intake was determined for the group by regressing average daily water intake on metabolic mid-body test weight and either ADG or DMI. RWI was then calculated as actual daily water intake minus expected daily water intake. The estimation of expected water intake using DMI had a higher R2 than when ADG was used (.36-.51 vs .31-.35). The range in off-test RFI was about one order of magnitude smaller than the range n RWI (e.g., RFI -0.90 to 0.73 kg vs RWI -7.34 to 8.49 L), indicating a relationship among DMI, ADG, and RWI that needs to be further explored. As animal agriculture continues to improve, efficiency needs to become a common measure and genetic progress needs to be made. There appears to be sufficient variation in the trait to make this feasible.

Funding: National Institute of Food and Agriculture

2. Expression of Melanocortin Receptors and Attractin in the Bovine Ovarian Follicle

Victoria Nist (Massillon, OH)

Institution: West Virginia University
Field: Sciences (Agriculture)
Faculty Advisor: Heather Chaney

Agouti-signaling protein (ASIP) is involved in lipid metabolism and ASIP mRNA is highly abundant in the bovine oocyte. Previous research identified melanocortin 1, 2, 3, 4, and -5 receptors (MC1R - MC5R) and attractin (ATRN) as receptors for ASIP. The present study aimed to characterize the expression of MC1R-5R and ATRN within the bovine ovarian follicle and oocyte via quantitative PCR (RT-qPCR). RNA was isolated from immature (GV) and mature (MII) oocytes, and follicular cells including cumulus cells surrounding GV (GV-CC) and MII (MII-CC) oocytes, granulosa cells (GC), and theca cells (TC). Ribosomal protein L19 (RPL19) expression was analyzed for normalization. Relative mRNA abundance was calculated using the standard curve method. Oocyte data was analyzed using a Student's t-test and follicular cell data was analyzed using a one-way ANOVA followed by Tukey's HSD. Both GV and MII oocytes, GV-CC, MII-CC, GC, and TC were found to express MC3R, MC4R, and ATRN and there was a significant effect of cell type for all three genes ($P < 0.0001$). Interestingly, MC3R, MC4R, and ATRN mRNA were highly abundant in GV and MII oocytes although there was not a significant difference between GV and MII expression ($P > 0.05$). Expression of both MC3R and MC4R was significantly higher in MII-CC than GC and TC ($P < 0.05$). ATRN expression was greater in CC followed by GC and then TC. Results indicate the potential involvement of MC3R, MC4R, and ATRN in folliculogenesis in cattle via ASIP signaling which future work will further investigate.

Funding: USDA National Institute of Food and Agriculture

3. Ceremonial Instrumentation from Pre-Columbian Costa Rica

Riley Klug (New Martinsville, WV)

Institution: West Virginia University
Field: Humanities (Anthropology)
Faculty Advisor: Megan Leight

This research project investigates the musical instruments associated with the Salazar collection at Winthrop University in South Carolina. These objects, found in the 1940's and recently bequeathed to Winthrop's Pettus Archive, are representative of a diverse range of Mesoamerican objects from the Costa Rican Atlantic Watershed to the Guatemalan Highlands. The study of ceremonial instruments within Pre-Columbian Costa Rica emerged in archaeological literature in the 1960s and 70s. Inspired by these early professionals, a recent exhibition held at Winthrop in September 2021 focused on presenting a portion of the donated collection on representations of animals and human figures for the first time.

This presentation analyzed the form and function of several of the musical vessels from the Salazar collection, and examines the cultural, symbolic, and spiritual associations with musical instruments in the Pre-Columbian past, particularly focusing on wind instruments and rattles with ceremonial contexts. A diverse range of scholarly literature from art historians, anthropologists, and ethnomusicologists were utilized in the paper to draw conclusions on these objects and their meaning. Ethnomusicologist Arnd Anje Both has examined similar types of ceremonial vessels and their sounds, associating them with ceremonial action, ritual events, and celebration.

Through a thorough literature review of comparative collections, I have determined the cultural and spiritual connections that these musical instruments may have had in their prime. Connections to reproduction and fertility, ceremonial offerings, and shamanism have been found within these objects, adding greatly to the cultural understanding of Pre-Classic Costa Rica. This research filled in many gaps on a much understudied area of auralscapes and material culture. In taking a greater look at the ceremonial and spiritual connections to music, archaeologists and art historians can develop a greater cultural understanding of ritual and ceremony in Pre-Columbian Mesoamerica.

4. Language Acquisition, Trauma, and Risk of ASD Misdiagnosis Among Syrian Refugee Children in the U.S

Manar Hesino (Morgantown, WV)

Institution: West Virginia University
Field: Humanities (Arabic Studies (research draws on various fields of study: language, communication, psychology))
Faculty Advisor: Manal AlNatour

Contrary to the research that has focused on the political aspect of the Syrian refugee crisis, our project utilizes an interdisciplinary approach in order to examine the difficulties integrating into Connecticut communities that Syrian refugees have experienced. The study is based on twenty live interviews with Syrian refugees in the Hartford and New Britain area. The goal of this article is to analyze the ways in which the Syrian war has influenced language acquisition in Syrian refugees and their families, and to examine how Syrian refugee children are being misdiagnosed with autism spectrum disorder (ASD). This study's main research question asks how trauma impacts language acquisition and its effects on the lives of Syrian children refugees. Drawing on various fields of scholarship—psychology, and language and communication, this paper analyzes how Syrian refugee children are misdiagnosed with ASD because of communication issues caused by the traumatic resettlement experience. Syrian refugee parents face a significant lack of knowledge regarding this disorder, leaving both them and their children at a disadvantage. Without the means to question the diagnosis, refugee parents may struggle to seek proper help for their children's traumatic resettlement and adjustment period.

Funding: Summer Undergraduate Research Experience (SURE) Enrichment Funding

5. Death and the Occult: the Impact of Western Esotericism on Arnold Böcklin's Paintings

Rebekah Gooding (Morgantown, WV)

Institution: West Virginia University
Field: Creative Arts (Art History (specifically))
Faculty Advisor: Megan Leight

In the late nineteenth century, Arnold Böcklin's paintings dealt with concepts of death, ritual, and the mythical world. At the same time, the concepts of Western Esotericism and Mysticism were growing in popularity within Europe. Symbolism – the artistic movement Böcklin was a member of – was a movement entrenched in Orientalism and Spiritualism. The Symbolists would have undoubtedly encountered Esotericism within their intellectual networks, so it would be logical to see at least some influence of these concepts in their work. Both Esotericism and Symbolism have to do with the investigation of the world through atypical lenses, Superstition, Magic, and the Occult and dream worlds and the unconscious respectively. A standard investigation of Böcklin's works deals with mythology as many of his works are mythological scenes. However, when observing his works through a spiritual, esoteric lens, there is a distinct tone of ritual practice, something that is heavily emphasized within mysticism. In addition, Symbolists focused on the concepts of death and mortality within their philosophy, something esotericism discusses when considering the ideas of the spirit. By coming from an atypical perspective and analyzing three distinct trends in Böcklin's works – depictions of places of ritual or worship, the Horsemen of the Apocalypse, and mythical creatures – through the lenses of the different branches of Western Esotericism one can achieve a deeper insight into the philosophies that drove one of the many artistic movements of the end of the nineteenth century or fin de siècle.

6. The effect of Immunotherapy on the Cardiovascular System

Chaysee Putnam (Morgantown, WV)

Institution: West Virginia University
Field: Health Sciences (Biochemistry)
Faculty Advisor: Brijesh Patel

Background: Target to background ratio of large arteries is an established method to study arterial inflammation. Immunotherapy in patients with cancer is known to induce inflammatory response in the body, and potentially can be detected using target to background ratio.

Methods: We reviewed and analyzed 21 positron emission tomography (PET) scans of patients with cancer, both before and after immunotherapy. Values were obtained from the ascending aorta, descending aorta, superior vena cava, and left ventricle.

Results: This study is still currently being conducted, as the data must be analyzed in order to make any further conclusions. The expected results would show stress being relieved on the heart once the cancer has been fully treated.

Clinical Implications: This study will greatly influence the way physicians treat cancer patients, as well as help them understand the cardiovascular effect from immunotherapy.

7. Lipid Modification of Cone Phosphodiesterase is Crucial for Color Vision

Chyanne Reid (Hedgesville, WV)

Institution: West Virginia University
Field: Health Sciences (Biochemistry)
Faculty Advisor: Visvanathan Ramamurthy

Our vision is a vital part of our lives, but for some people that is not the case, disorders like achromatopsia cause color blindness and a lack of visual acuity. Color blindness occurs due to defects in the function of cone photoreceptor cells present in the retina. Cones mediate daytime and color vision and are compartmentalized made up of an outer segment and an inner segment. The outer segment is the light sensing organelle, and the inner segment is the part of protein synthesis. My research investigates the mechanisms behind achromatopsia related mutation leading to a loss of lipid modification in the protein cone Phosphodiesterase (PDE6). Our lab created a mutant mouse model modeling the mutation observed in humans, to address why a defect in cone PDE6 lipid modification causes impairment in cone photoreceptor function. We performed electroretinography (ERG) to test the response to light. The ERG results showed that the cones in mutant mice were not functional, phenocopying the observations from human patients. To determine if the PDE6 protein was still being expressed in the mutant, we performed immunohistochemistry on retinal sections. Our data showed that the mutant PDE6 protein is produced in the inner segment but is not localized or trafficked to the outer segment. Altogether, our findings show that the lipid modification of cone PDE6 is essential for its localization in the cone outer segment where it is required for cone-mediated vision. Our findings provide a mechanism to understand humans afflicted with PDE6 related color blindness.

Funding: National Eye Institute

8. Understanding the Biosynthesis Regulation of the Anti-Malarial Compound, Artemisinin, in Artemisia Annua

Ella Moats (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Biochemistry)
Faculty Advisor: Vagner Benedito

Progress on malaria treatment has stalled since 2015, and yearly, more people experience its deadly effects as funding, health care, and vector control remain inadequate in sub-Saharan Africa, where 98% of malaria deaths occur. One component of this treatment is the chemical artemisinin, derived from Artemisia annua. Artemisinin is a sesquiterpene lactone with a peroxide bridge, which is a very difficult and expensive structure to synthesize in vitro. Its biosynthesis pathway has many branches that takes carbons away from the production of the compound of interest. Aiming to optimize carbon flow in the terpenoid pathway to increase the synthesis of artemisinin is the goal of this research. For that, understanding which genetic elements in the plant are involved in determining where carbon flows in the terpenoid pathway is key. The hypothesis of this research is that carbon will flow more strongly towards artemisinin biosynthesis by identifying and knocking out genes involved in monoterpene and other sesquiterpene compounds. To do this, a unique Artemisia annua germplasm collection at WVU will be studied by using GC-MS to quantify specific terpenoids and genomic analysis, to identify elements involved in carbon flow. By identifying these genes, and modifying the genome of Artemisia annua to better suit the needs of the medical industry, we will contribute to creating affordable, accessible treatment for those struggling with the effects of malaria.

9. Probing the Morphological and Mechanical Changes in a C. elegans Model of Huntington's Disease

Zachary Ellis (Rencik, WV)

Institution: West Virginia University
Field: Sciences (Biochemistry)
Faculty Advisor: Justin Legleiter

Huntington's Disease (HD) is a fatal neurodegenerative disease caused by a mutation in the huntingtin gene, in which CAG nucleotides are excessively repeated. In turn, translated huntingtin protein (htt) contains an expanded polyglutamine (polyQ) domain, which triggers protein aggregation, the hallmark feature of this disease. Common symptoms of HD, such as chorea, muscle atrophy, and behavioral and neurological decline, continue to worsen as the disease progresses. This study aims to investigate the relationship between polyQ domain length and age-dependent morphological and mechanical changes in a Caenorhabditis elegans model of HD. C. elegans are an established model species to investigate aging, as morphological and mechanical changes—such as epidermal roughening and whole body decrease in Young's modulus, respectively—occur as a function of age. We expect to observe age-dependent morphological changes much earlier in the pathogenic C. elegans (Q128), as opposed to age-matched, non-pathogenic C. elegans (Q15). Morphological analysis was performed using tapping mode atomic force microscopy (AFM), and images were processed using custom MATLAB scripts to determine RMS roughness. Further studies will be conducted to investigate the role of age-dependent changes in mechanical properties, such as Young's modulus, as they relate to polyQ domain length. We expect to observe age-dependent mechanical changes much earlier in the Q128 worms, in comparison to the Q15 worms. Additional studies may be conducted to determine if these changes serve as a peripheral biomarker of HD, as well as the role of such a biomarker in diagnostic, prognostic, and therapeutic strategies.

Funding: Arnold and Mabel Beckman Foundation

10. A Deep Learning Approach to Understanding Emotion

Amirah Mitchell (Navarre, OH)

Institution: West Virginia University
Field: Engineering (Bioinformatics)
Faculty Advisor: Jeremy Dawson

The world as we know it is being changed every day through the implementation of artificial intelligence (AI). These machine-learning-based systems can be trained to perform a variety of tasks, including the potential to detect emotion in face photos or video: emotion-AI. A neural network, a program mimicking the operations of the human brain in decision making, that can detect emotion will help the world's mental health crisis in daily life. This can include road-rage and sleeping while driving. In a typical machine learning/artificial intelligence application, thousands, if not millions, of input data are needed to properly train the program. Then as the program begins to train, a network can detect the proposed category of input data in real time (inferencing). A prototype version of an emotion-AI program will be one of the first steps artificial intelligence can take to inclusively manage our emotions. In the most appropriate time to launch the program, its implementation will help the current innovations in AI, such as the automotive market, with implementing an emotion-AI program. A vehicle may be able to translate to whomever is available to help the driver if crucial events mentioned above were to occur. This same idea should also be the program in a device for conditions like Alexithymia, mostly found in autism. The advantage of having an emotion-AI program includes the ability to increase its parameters as the signs and symptoms of mental health have increasing accuracy with efficient research. For the work presented here, a pre-trained model from a deep learning (neural network) framework called PyTorch was used. This framework was implemented through Jupyter notebook using the Nvidia Jetson-Nano device. Training for this program was limited but was able to translate accuracy and loss with appropriate widgets, so appropriate evaluation could be done.

Funding: LSAMP

11. Genome Wide Association Study (GWAS) of Dietary Responses to Habanero Pepper Diet in Drosophila melanogaster

Amartya Das (Dunbar, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Umesh K. Reddy

Chili peppers represent an important crop worldwide due to the beneficial properties of their phytochemicals including carotenoids, capsaicinoids, phenolic compounds, vitamins, and minerals. These compounds have been associated with the control of obesity, the reduction in the risk for coronary disorders, diabetes, cancer, osteoporosis, and neurodegenerative diseases. However, focused research in Drosophila has not yet been fully addressed. Thus, this study aims to identify the genes related to the phenotypic responses shown by Drosophila melanogaster after being fed with a habanero pepper diet using GWAS analysis. We used the wild-derived lines from the Drosophila Genetics Reference Panel (DGRP) flies reared on control and 7.5% (w/v) habanero pepper-containing diets. Experiments were initiated by placing approximately 5 males and 5 females onto vials containing the different diets. Adults were allowed to lay eggs for 72 h before being removed. The larvae were fed and once the adult stage was achieved, these flies were selected for bodyweight and triglyceride determination. After obtaining the phenotypic data we performed a GWAS analysis using the easyGWAS platform. In total 66 DGRP genotypes were analyzed, and we observed a significant reduction in the body weight and triglyceride content under pepper treatment at both sexes for most of the genotypes. The GWAS analysis identified the top associated genes of habanero pepper response such as CG33967, Trim9, CG42318, CG33988, Hr38, Ilp3, CG8010, Lilli, and Msr-110. This study provided a comprehensive understanding of the phenotypic response and the genes underlying pepper diet effects in Drosophila.

Funding: West Virginia State University

12. The Use of Biochar as a Soil Amendment to Mitigate Climate Change

Ameris Chadband (Dunbar, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Amir Hass

Climate change result in increase in frequency and intensity of extreme weather events, adversely affecting community's livelihood and food production. The main cause of climate change is due to increase in CO2 and other greenhouse gas emission in the atmosphere due to extensive use of fossil fuels during the last two centuries. Carbon sequestration, the process of removing carbon from the atmosphere and storing it in various environmental reservoirs, can assist in mitigating climate change. Carbon sequestration in soil, while reducing greenhouse gas concentrations in the atmosphere, is also benefiting soil productivity and health by improving soil structure, water drainage and retention, and reduces the risk of erosion and nutrient leaching. Biochar, a stable carbon-rich charcoal-like material made by heating biomasses at a high temperature in anoxic conditions can further improve soil carbon sequestration. Since biochar is a stable form of carbon it can last for hundreds of years in the soil. In this study we evaluate the impact and benefits of the use of biochar as soil amendment in different soil types in West Virginia.

13. Genetic Variation Among Different Species of Lepomis (Sunfish) in West Virginia

Desirae Ledesma (Charleston, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Sean Collins

The genus Lepomis (sunfishes) is a very common taxon of centrarchid fishes that ranges throughout the Eastern half of the United States with relatively small isolated populations in the West. They comprise approximately 13% of all fish species in West Virginia where they are also among the most common fish in small ponds, lakes, and streams. Bluegill, *Lepomis macrochirus*, are widely exploited here in WV as a food source, and, because they are a prey option for a wide range of fishes, they are also a commonly used bait for catching game fish such as catfish, pike, and bass. Bluegill are also a popular fish for recreational and sport fishing. My research has shown that larger lakes are more prone to higher rates of juvenile mortality and reproductive precociousness relative to smaller ones. These data support other studies that have shown that in situations where fishes experience high levels of predation that it can shorten the duration it takes to reach sexual maturity.

The goal of the next phase of our research is to determine whether overexploitation of bluegill has affected their populations at the genetic level, both in terms of overall variation, but also in the rate at which bluegills may hybridize with other Lepomis, most significantly, green sunfish, *L. cyanellus*.

Funding: NASA WV Space Grant Consortium, NSF Louis-Stokes Alliance for Minority Participation (LSAMP) HRD #1826763, and the Title III Part B of the Higher Education Act of 1965

14. OOSNCR1, a novel oocyte specific long-non-coding RNA in cattle, is cytoplasmic and maternally derived

Emily Dugan (Mineral Wells, WV)

Institution: West Virginia University
Field: Sciences (Biology)
Faculty Advisor: Jianbo Yao

In mammals, proper development during early embryogenesis relies on the regulation of maternal transcripts. These transcripts undergo gradual degradation accompanied by an activation of the embryonic genome. Recently, long-non-coding RNAs (lncRNAs) have been characterized as key regulators of embryonic genome activation in humans and mice and their mechanisms in early embryogenesis remain poorly understood. The objective of this study was to determine if OOSNCR1 is maternal in origin and to localize the transcript in oocytes using fluorescence in situ hybridization (FISH). Ovaries were collected from a commercial abattoir, aspirated to collect cumulus-oocyte-complexes (COCs), and underwent IVF. Zygotes were randomly assigned at 12 hours-post-insemination (hpi) to either control or α-amanitin (25ug/mL) treated culture medium. All embryos were cultured until the 4th embryonic division at 52hpi. Following collection, samples were spiked with GFP and underwent RNA-isolation followed by cDNA synthesis. Real Time Polymerase Chain Reaction (RT-qPCR), using GFP as an exogenous control, was performed to quantify relative expression using the standard curve method. For localization, oocytes were fixed, hybridized to a custom probe, mounted to slides, and imaged using confocal microscopy. A student's t-test revealed no significant difference between transcript amount in treated (15.46+0.0074) versus control (15.60+0.0049; $P = 0.34$) embryos signifying a maternal origin. Control and embryos cultured in α-amanitin revealed blastocyst rates of 0% and 50%. FISH detected OOSNCR1 throughout the cytoplasm of oocytes. These data suggest OOSNCR1 is cytoplasmic and maternally derived. Future studies aim to elucidate the role of OOSNCR1 in oocyte maturation and early embryonic development.

Funding: SARE

15. Effects of Handwashing and Antimicrobials on Bacterial Counts

Emily Hissom (Charleston, WV)

Institution: University of Charleston
Field: Health Sciences (Biology)
Faculty Advisor: Mark Watson

It is everyday practice to utilize aseptic techniques, which are simply actions taken to prevent the accumulation of bacteria and other microbes to prevent disease and its spread. Handwashing is an important aspect of hand hygiene because hands pick up the microbes on surfaces and are easily transported from person to person through direct contact or indirectly through contact with surfaces. According to the CDC and WHO, many diseases are spread by not washing hands effectively, therefore hand hygiene is important everywhere in society, especially in healthcare where the spread of disease can mean life or death.

In this study, we analyzed data collected from the student population of a microbiology class from the University of Charleston in West Virginia over the span of nine years (2014 to present) regarding the effectiveness of various antimicrobial aids on the elimination of bacteria. We measured the number of colony forming units (CFU) from students' hands prior to manipulation (control), using just water, using soap and water, and using hand sanitizer. We hypothesized that handwashing and use of antimicrobial aids such as hand sanitizer will reduce the number of bacteria on hands compared to controls. An analysis was also performed comparing pre-pandemic and post-pandemic data to determine if the perception of handwashing has changed behavior which would alter the normal microfauna on the hands. This analysis revealed that there was a significant difference between handwashing techniques ($p<0.001$) and pre and post pandemic times ($p<0.001$).

16. Water-soluble phenolics from invasive plant Microstegium vimineum impacts soil microbial communities and mesofauna.

Gabriella Hill (Huntington, WV)

Institution: University of Charleston
Field: Sciences (Biology)
Faculty Advisor: Aida Jimenez Esquilin

Microstegium vimineum known as Japanese stiltgrass (JSG) is an annual invasive grass detrimental to ecosystems. Our previous research showed that JSG increased soil pH and modified the rhizosphere microbial community. Because invasive plants make allelopathic chemicals, we hypothesized that phenolics produced by JSG may explain the changes in soil pH and microbial communities. Leaves and soil were collected from an invaded hiking trail at Kanawha State Forest in Charleston, WV. Dried leaf material was made into two types of litter tea: whole leaf leachate (10% w/v) to collect water-soluble phenolics from surfaces and a ground leaf solution (5% w/v) to collect phenolics released upon tissue breakage. A native grass was used for comparison. Water-soluble phenolics were present in both types of litter teas for both types of grass (72-102 ug/mL GAE). In a microcosm experiment with a combination of factors (soil type and litter tea type and controls) and using Biolog Ecoplates® and principal component analysis, we found that the addition of either litter tea significantly changed the microbial community structure and function. PC1 separated samples that received phenolics from those that received only water ($p < 0.001$). PC2 separated samples by the source of phenolics (plant type, $p < 0.001$). Microbial communities exposed to phenolics from JSG were more metabolically active and used a larger variety of carbon sources. Currently, we are investigating the effect of these phenolics on the Collembola species Folsomia candida to sort out the impacts of these phenolics on higher trophic levels.

Funding: National Science Foundation Grant No.1930362

17. Na, K-ATPase β2 Subunit is Indispensable for Maintaining Retinal Neural Circuitry and Function

Jack Evans (Annapolis, MD)

Institution: West Virginia University
Field: Health Sciences (Biology)
Faculty Advisor: Saravanan Kolandaivelu

The Na+, K+-ATPase (NKA) pump has an essential role in the maintenance of ionic gradients in all cell types. In the retinal photoreceptor neurons, NKA is indispensable for maintaining circuitry crucial for the conversion of light into electric impulses. The NKA pump exists as a heterodimer, consisting of one catalytic α3 (ATP1α3) and one non-catalytic β2 (ATP1β2) subunit present in the photoreceptor inner segments. Mice lacking ATP1β2 have been known to show severe photoreceptor degeneration and death at the age of P16 due to brain defects. However, the precise role of ATP1β2 in the retina is not clearly understood. To understand further, we generated a retina-specific conditional mouse model that lacks ATP1β2. We evaluated retinal function, protein concentration/localization, and retinal neural circuitry by electroretinography, immunohistochemistry, and immunoblot analysis at various ages. Our data showed no photoreceptor function at the earliest age of P14, and immunoblots indicate the destabilization of many phototransduction proteins. However, significant increases in NKA non-catalytic isoform ATP1β1 doesn't rescue retinal function and structural stability. Additionally, NKA interacting protein partner retinoschisin-1 (RS1), is severely destabilized. NKA loss in the retina led to several structural abnormalities including synapse formation and retinal neural circuitry. Our data demonstrated the compression and blending of several retinal layers, including the photoreceptors, outer plexiform layer, and inner nuclear layer. In summary, our data discloses that ATP1β2 is indispensable for several unresolved questions other than photoreceptor function and survival including ATP1β2's role in the maintenance of neural circuitry and retinal morphology.

Funding: National Institutes of Health

18. Fungi: Building a Better World

Jafet Rivera Hernandez (South Charleston, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Fungi research/ Douglas Bright

One of the most common pollutants in the environment is styrofoam. Styrofoam contains styrene which leaks into the contents the styrofoam is holding. Additionally, once the styrofoam enters the environment, scavenger animals will digest the harmful chemicals released by the styrofoam. This work focuses on assessing the structural integrity of varying types of fungal mycelia for the development of myco-blocks. Myco-blocks could provide eco-friendly alternatives to plastic, styrofoam, and possibly even wood. The mycelium used for the myco-blocks was grown in sterile hemp. The fungal species selected were Turkey tail (Trametes versicolor) and reishi (Ganoderma lingzhi) which are in the order Polyporales, and Pearl oyster (Pleurotus ostreatus) and King trumpet (Pleurotus eryngii) which are in the order Agaricales. Once the mycelium had sufficiently spread through the substrate, it was added to the designated mold. After approximately 4 weeks of growth the mold was opened and the myco-block was allowed to dry. The results gathered were that myco-blocks will have different structural properties when different species of fungi are used. Our preliminary results show that Polyporales provided the greatest structural integrity and was not brittle like the Agaricales.

Funding: WV STaR

19. Generation of bioluminescent Serratia marcescens

Kate Perkins (Huntington, WV)

Institution: Marshall University
Field: Sciences (Biology)
Faculty Advisor: Lydia Bogomolnaya

Serratia marcescens is an opportunistic pathogen with increasing clinical importance due to intrinsic resistance to several classes of antibiotics. The gram-negative, red pigmented, bacteria are a member of the order Enterobacterales, where it has largely been recovered from a substantial variety of clinical specimens. S. marcescens causes central nervous system diseases such as meningitis, urinary tract infections, pneumonia, bloodstream infections, various respiratory diseases, and many different types of wound infections. The research I participated in took an Escherichia coli strain that carried a Tn5 mini transposon that contained promoterless luxCDABE operon from Photorhabdus luminescens and transferred this construct to S. marcescens SM6 strain through the process of conjugation. The luxCDABE operon can be used as a bioluminescent reporter for constitutive and inducible promoters. I screened the resulting bioluminescent strains of S. marcescens to identify a conjugate that produced light at an optimal time and magnitude during bacterial growth. I found that S. marcescens luxCDABE candidate strain KP8 produced light constitutively throughout bacterial growth. Sequencing results showed that luxCDABE operon has integrated in the promoter region of EG355_RS21810 locus of S. marcescens KP8 genome. To ensure that the resulting strain will be competitive with its environment, and therefore, will be suitable for the animal studies, I completed fitness experiments between KP8 and the wild type strain S. marcescens using minimal medium with limited nutrients. The results of these experiments suggest that the mutant strain could be used to study S. marcescens pathogenesis in mice.

20. Optogenetic & Olfactory Investigation of Serotonergic Neuron Regulation in Drosophila melanogaster

Maggie Robertson (Saint Marys, WV)

Institution: West Virginia University
Field: Sciences (Biology)
Faculty Advisor: Andrew Dacks

Every day, animals experience changes in their internal state and external environment. To survive, animals must respond to these changes by appropriately adjusting their nerve activity and behavior, and this can be achieved by a process called neuromodulation. Neuromodulation alters behavior by utilizing neuromodulators, such as serotonin, to modify the excitability and synaptic efficacy of target neurons. As a neuromodulator, serotonin influences a variety of behaviors and is found in nearly every sensory system. Across sensory systems, serotonergic neurons receive diverse inputs, meaning that the conditions regulating serotonin release are complex and cannot be universally defined. To better understand these conditions, we investigated the CSDns: the only serotonergic neurons within the olfactory circuit of Drosophila melanogaster. Previous work found that the CSDns receive extensive input from two formerly undescribed pairs of glutamatergic neurons dubbed the SIMPALs. In order to determine which conditions influence serotonin release from the CSDns, we optogenetically activated the SIMPALs and measured the flies' performance in two behavioral assays. The first assay was designed to measure if SIMPAL activation alone would trigger behavioral changes, and the second was designed to measure if SIMPAL activation in the presence of an odorant would affect olfactory guided behavior. While SIMPAL activation in either assay did not induce any significant behavioral changes, these findings help isolate the conditions that regulate serotonin release and modulation.

Funding: National Institutes of Health - DC 016293 to AMD

21. Assessment of Avian Diversity in Kanawha State Forest

Myrisha Haney (racine, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Myrisha Haney

Assessing the biodiversity of wary animals can be very difficult using typical observational techniques. Trail cameras have enabled scientists to survey species that may elude the naked eye by being able to detect animals that may be wary or otherwise difficult to observe. The animal biodiversity of West Virginia is fairly well known but because of the high percentage of natural forest in the state, the potential for observing unusual, rare, or previously unknown species here is high. With this in mind, we surveyed the animal fauna of Kanawha State Forest (KSF) using trail cameras. Our study had 2 main objectives: 1) to assess the biodiversity of birds, and 2) to determine the efficacy of using trail cameras as tools for assessing biodiversity of these animals. Ten trail cameras were set up at six sites throughout KSF for at least a week each. Over the course of our study, in excess of 18,000 images were captured. While the forest is a known "way station" for migrating birds as well home to a healthy community of resident species, we were only able to reliably identify 10 unique bird species across the 6 sites. Most species were residents, but we did identify two migratory species, a scarlet tanager (Piranga olivacea) and an American goldfinch (Spinus tristis). Our results suggest that trail cameras may not be the most useful tool for assessing avian biodiversity and that citizen scientists and other commonly used on-site bird surveying methods are more effective for surveying avian biodiversity.

Funding: NASA

22. PCR confirms Borrelia in community-sourced ticks (Ixodidae): Implications for Infection Rates of Lyme borreliosis

Olivia Carpenter (Canvas, WV)

Institution: West Virginia Wesleyan College
Field: Sciences (Biology)
Faculty Advisor: Olivia Carpenter

The expanding geographic distribution of various tick species in North Central West Virginia is contributing to the increase in positive cases of vector-borne diseases caused by ticks. Pathogens carried by ticks are the primary culprit of vector-borne diseases transmitted to humans. These diseases can be caused by a variety of pathogens, but the focus for this research is Borrelia burgdorferi. The bacterium family Borrelia transmits Lyme disease, which is rapidly growing in prevalence in the U.S. In North Central West Virginia there are three common tick species, Ixodes scapularis, Dermacentor variabilis, and Rhipicepalus sanguineus, which were the focus for this research. We have accessioned 1452 ticks to date. Approximately 965 are female, 455 are male. Of the 1452 ticks, 572 are female Ixodes scapularis, 212 are male I. scapularis, 219 are female Dermacentor variabilis, and 102 are male D. variabilis. There are 175 female ticks of other species, and 39 are males of other species. In the future, the inventory of ticks from 2018-2022 will be tested using PCR to examine if the ticks are carrying pathogens that can cause vector-borne diseases. Traveling increases the risk of introducing a non-native, possibly invasive tick species to the local ecosystem upon return.

Funding: SURE Grant and Maier Foundation

23. Disruption to Discovery: Transporter Knockdown Provides Insight into Tsetse Development

Rachel Morris (Charleston, WV)

Institution: West Virginia University
Field: Sciences (Biology)
Faculty Advisor: Rita Rio

Tsetse flies (Diptera: Glossinidae) are the medically and economically significant vectors of African trypanosomes which cause significant detriment to public health and economic stability in sub-Saharan Africa. As strict blood feeders, tsetse flies rely on an obligate bacterial symbiont, Wigglesworthia glossinidia, to provide crucial B-vitamins for fitness and reproduction. The removal or functional disruption of this microbial symbiosis results in tsetse fly sterility. In return for B vitamin provisioning, tsetse flies provide amino acids to their Wigglesworthia symbiont. Membrane transporters are keystone regulators of metabolic exchange at the host-symbiont interface. Therefore, the highly expressed tsetse transporter proton-coupled amino acid transporter (PAT), is believed to play a crucial role in the symbiosis. Here, we describe the use of RNA interference (RNAi), delivered in the pupal and teneral life stages, towards the knockdown of PAT expression. Successful knockdown of PAT was observed, prompting functional analyses determining phenotype outcomes towards tsetse lifespan and reproduction. Interruption of transporters (such as PAT) which underly the metabolic integration of tsetse and Wigglesworthia may provide targets for novel pesticide design, and ultimately, suppression of disease transmission.

Funding: NIH-NIAID

24. Effect of Ellagic Acid and Retinoic Acid on Elastin and Collagen Production in HDFs

Chloe Duckworth (Flat Top, WV)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Nasim Nosoudi

Elastin is a fibrous protein key to the structure and support of skin as well as other organ tissues. Elastic fibers are located in the skin's dermal layer and make up approximately 2% to 4% of the fat-free dry weight of the dermis in the skin of adults. Aging causes the progressive degradation of elastin fibers1. Loss of these fibers can cause skin sagging and wrinkling, loss of healthy blood vessels and lung capacity, aneurysms, and Chronic Obstructive Pulmonary Disease (COPD). We hypothesized that ellagic acid, a polyphenol, will increase elastin in human dermal fibroblasts (HDF) due to polyphenols' elastin binding properties. We treated HDF's with 2µg/ml ellagic acid for 28 days to see the elastin deposition in HDF cell cultures. To test this, we treated HDFs with polyphenols ellagic acid for 3, 7, and 14 days. For comparison purposes, we included a group of ellagic acid and retinoic acid since retinoic acid is already in the market for elastin regeneration purposes. When ellagic acid and retinoic acid were introduced together, insoluble elastin and collagen deposition were significantly higher in HDFs compared to other groups. Thus, polyphenols and retinoic acid can improve skin extracellular matrix production of elastin and collagen and may improve skin fine wrinkles. We have shown that a combinational treatment with retinoic acid and ellagic acid human increase elastin and collagen in the extracellular matrix of HDFs in vitro. Further research is needed to show the applicability of this method in vivo to improve skin elasticity.

Funding: National Science Foundation

25. STRESS ANALYSIS OF MINI-SCREW ASSISTED RAPID PALATAL EXPANDER USING FINITE-ELEMENT ANALYSIS

Egon Mamboleo (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Biomedical)
Faculty Advisor: Osama Mukdadi

The aim of this study is to evaluate the effect of soft tissues and bone interactions in the human skull undergoing MARPE (Mini-Screw Assisted Rapid Palatal Expander) based loading conditions. The soft tissue under investigation includes sutures, trabecular bone, and the PDLs (Periodontal Ligament). The model of a human skull (3D) was segmented through 3D-Slicer, a program that is used for medical imaging and volumetric 3D exportation from CT-Scans. Sutures along with the skull's cortical and trabecular bones are refined in Meshmixer and ANSYS SpaceCliam. Meshmixer is primarily used to smoothen the segmentation output and SpaceCliam is used to create sutures from existing geometry and combine models from different programs. Lastly the full model is imported to ANSYS Mechanical for Finite Element Analysis. The simulation has about 1.1 million nodes and 650,000 elements. The element type is a high-order (10 node quadratic) tetrahedral (H) element (SOLID 187 in ANSYS-Speak). The boundary conditions are a fixed support on the top and back of the skull. The MARPE device and screws utilized in the simulation were designed in Solidworks. To simulate actuation of the screw mechanism for the MARPE device, a displacement of 1.2510-4m was applied on each side of the MARPE device to represent the displacement caused by one full turn of the jackscrew (2.510-4m). The results produced high stresses and strains in the regions closer the Midpalatal suture and also in the MARPE device itself as expected. The screws experienced stresses of about 270 MPa. The separation of the Midpalatal suture did deform in the expected "V" shape. The sutures and trabecular bone experienced minimal stresses. These initial results of our study are a first step towards the validation of the development of a clinical pre-operative planning tool for orthodontic advancement.

Funding: Louis Stokes Alliances for Minority Participation (LSAMP)

26. Effect of 1-min spin on human endothelial cells at the vertical spin tunnel

Emma Barrett (Culloden, WV)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Joon Shim

Title: Effect of 1-min spin on human endothelial cells at the vertical spin tunnel
Objectives: This study aims to test gene (mRNA) expressions found from human caudate nucleus in health and disease such as normal pressure hydrocephalus (NPH) with increasing age in human vascular endothelial cells (vECs) exposed to spinning motions at the vertical spin tunnel (VST).

Method: We cultured human (vEC) line attached to the coverslip placed in a conical capsule (with payload of 64 g) with culture media and exposed cells to the 20-Foot (FT) VST at NASA Langley Research Center. We isolated the total RNA from both groups of the ground control and those exposed to spin motions and assessed the mRNA expressions. We then stained the cells on the coverslip to compare the responses of microtubules in endothelial cells exposed to the same mode of 1-min spin at the VST.

Result and discussion: Multiple runs of the pretest with tether on and/or off suggest that, although free fall in the absence of tether, when successful, more closely recapitulates emergency exit, the stability of spinning characteristics critically depends on the shape of external capsules in which human vECs are located on the coverslips in the conical tubes. Hence, we applied a more controllable mode of fall to the cells in the presence of tether and exposed them to the VST for 1 min. We found that human vECs were viable and attached to the coverslips. Human vECs abundantly express transmembrane protein 38B (TMEM38B), a novel but understudied druggable ion channel gene. Spin at the VST for 1 min led to a reduced TMEM38B mRNA expression in the cells as compared to the ground control. The results suggest that the spin motion for 1 min at the VST gives rise to an effect against aging in human vECs as compared with the human caudate nucleus assays on neonatal and elderly specimens.

Funding: NASA

27. Mechanical Motion Capture System

Eugenia Marcelli (Beckley, WV)

Institution: West Virginia University Institute of Technology
Field: Engineering (Biomedical)
Faculty Advisor: Winnie Fu

In order to improve the lives of those who suffer from health conditions affecting their muscle-skeletal system, the collection of data relative to the kinematics of their joints is an extremely useful tool. Optical motion capture systems (OMC) are currently the most widely used and most reliable piece of equipment utilized to record kinematic data. These systems can detect motion through cameras and reflective markers and record viable data for the performance of gait analysis. Nevertheless, optical motion capture systems are constrained to in-lab settings.

Systems that utilize inertial measurements units (IMUs) have also recently been developed. Although they are still in the early stages, IMUs seem to answer the need of translating the detection and recording of motion to everyday settings rather than in limited laboratory settings. These devices consist in relatively small wearable wireless units able to record the motion of the body they are attached to, as the person performs their daily tasks.

We aim to develop an innovative motion capture system that is slim, flexible, and comfortable. The device will also be wearable underneath clothes, accommodate people of all BMIs, and allow unrestricted range of motion.

The team aims to develop a device that utilizes wireless rechargeable batteries for powering, a dielectric elastomer sensors, a sports compression sleeve for attachment, a SD card for data storage, and a Bluetooth connection for transferring data. A computer software will also be used to calculate and analyze the data.

Funding: Mechanical Engineering Department

28. The Effect of the COVID-19 Vaccines on Individuals Who Develop Incidences of Non-traumatic Intracranial Hemorrhages

Isabella Gharib (Charleston, WV)

Institution: Marshall University
Field: Health Sciences (Biomedical)
Faculty Advisor: Frank Annie

The effect of mRNA COVID-19 vaccines on individuals that develop incidences of non-traumatic intracranial hemorrhages is still poorly misunderstood. Previous research from varying sources has indicated the presence of a non-traumatic intracranial hemorrhage in conjunction with exposure to COVID-19. This research aims to understand if there exists a difference between non-traumatic hemorrhagic events among those that received either the Pfizer, Moderna, or Johnson & Johnson vaccine compared to those that contracted COVID-19 with no previous vaccination. A total of 3,292,540 patients were included in the study. Of those patients, 1,467,116 (44.5%) were lab-confirmed COVID-19-positive cases that did not have a record of a previous COVID-19 vaccine. 1,008,708 (30.6%) were given Pfizer, 784,622 (23.8%) were given Moderna, and 32,094 (1.1%) were given the Johnson & Johnson vaccine. Non-traumatic hemorrhagic events were significantly reduced in Pfizer cases (0.014% vs 0.144%, $P<0.001$) (100% risk reduction) within 30 days compared to the lab-confirmed COVID-19 positive patients that did not receive a COVID-19 vaccine. Moderna (0.008% vs 0.154%, $P<0.001$) (94.6% risk reduction) and Johnson & Johnson (0.069% vs 0.174%, $P=0.001$) (59.7% risk reduction) both reduced hemorrhagic events, as well. The results clearly illustrated there was a reduction of non-traumatic hemorrhagic events within 30 days of COVID-19 diagnosis by the use of the COVID-19 vaccine. In addition, the COVID-19 vaccine was shown to significantly reduce the risk of all the following secondary endpoints: mortality, cerebral infarction, critical care service, acute myocardial infarction, nontraumatic subarachnoid hemorrhage, erectile dysfunction, ventilator management, and tachycardia.

Funding: CAMC

29. Inducing Chondrogenesis of Mesenchymal Stem Cells Through Electrospraying

Joshua Conrad (Evans, WV)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Nasim Nosoudi

Electrospraying is the process of using electricity, specifically a difference in voltage, to derive a solid material from a fluid polymer solution. This process is used constructing cell scaffolds for biomedical and tissue engineering purposes. The effects of incorporating live cells into the fluid solution and conducting the electrospraying process has been seldom explored. In this study, stem cells derived from adult human fat tissue was directly input into a polymer solution and electrosprayed, inducing differentiation into chondrocytes (cartilage cells), without the addition of any other chemical factors. Typically, such a differentiation requires the use of exogeneous factors which can include growth factors or likewise substances that chemically induce the change however, this study only utilized the voltage difference and shear forces that the electrospraying process causes. The study consisted of three groups: voltage difference of 10kV, voltage difference of 15kV, and a control that was not electrospun. The 10 and 15kV groups both indicated the expression of transcription factor Sox9 which induces stem cells to differentiate into proliferating chondrocytes, marking a step in chondrogenesis. The presence of Sox9 only within the electrospun samples supports the notion that electrospraying at 10 or 15kV can produce chondrocytes without the use of exogenous growth factors. This data suggests that electrospraying has the potential to be used in Autologous Chondrocyte Implantation therapy to differentiate autologous fat cells into chondrocytes.

Acknowledgements: Was supported by NSF 2116140, NSF S STEM" grant (2030806), WV Higher Education Policy Commission- Division of Science and Research (dsr.20.16).

Funding: National Science Foundation (NSF)

30. Modeling Aortic Phantoms and Lynch Coils in 3-Dimensional Experimental and Computational Domain

Raegan Halley (Mc Leansboro, IL)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Joon Shim

Objectives: This study aims to model aortic phantoms in the wet-lab environment and the computational domain using finite element method as part of the Senior Capstone project.

Method: In the project we were provided with polyethylene (PE)-60 tubing to design our Lynch coils and scaled aorta. In the beginning, we measured the length (22 cm) of tubing and wrapped the tubing around a syringe and applied scotch tape to the tubing to hold it in place. Once sufficient tape was applied, the coils were placed into boiling water at 100°C for one minute to change the shape of the straight tube into that of the coil or aortic phantom. Once boiled, the coil was displaced into ice water to cool down the coil and to bring it back to room temperature so it would keep its shape. With this in hands, we then measured the dimensions and created the computational aorta using ANSYS software (rel. 2021).

Result and discussion: In total, five coils were created and two will be used for the experiment. The first coil to be used is the second coil of Phase 1 with the smaller diameter to be used in the mouse brain. This coil holds 100 uL of infusate and is the proper size to fit into a rat brain. We next created the aortic phantom that fits a scale of an adult rat. In the computational domain, we created the geometries, the mesh in triangle element, and solved the problem by applying fluid properties with blood viscosity with the assumption that fluid flow is Newtonian. We found that the geometries of aortic phantom and computational phantom are in fairly good agreement, particularly in the convexity and/or concavity of the curved site near renal arteries. The computational models allowed us to visualize the blood flow in ascending and descending aorta as well as renal arteries in which flow recirculation was detected. These models will pave the groundwork to further create the umbrella-type novel angioplasty that we aim at in the future.

Funding: Marshall University and State of West Virginia

31. Biomimetic Structural Self-Assembly

Ryan Wager (Waverly, WV)

Institution: West Virginia University
Field: Health Sciences (Biomedical)
Faculty Advisor: Ryan Wager

Biomimetic structures act as building blocks for biomedical engineering. Learning more about these structures and how to create certain types will improve our understanding on how to apply these structures for various bio-medical applications. In this study, innovative biomimetic structures were generated using layer-by-layer self-assembly. Three chemicals were studied including poly-L-lysine (PLL), poly-L-glutamic acid (PLGA), and . PLL/ PLGA coatings were formed based on electrostatic interactions. Various substrate materials such as stainless steel, quartz, and glass were used to prepare the biomimetic structures. Each substrate was dipped into the chemical solution for 15 minutes rinsed with deionized water, and then air dried before being placed into the next solution, rinsed, and dried. This process was repeated for many (e.g., 40) cycles to create the biomimetic structures. The layer-by-layer self- assembly process was carried out manually. To scale up, we also programmed a robotic machine to do the same process stated above. The produced biomimetic structures were imaged using a scanning electronic microscope. In the future, varying the layer-by-layer self- assembly process parameters (e.g., pH, salt concentration, chemical deposition) will optimize the production of the biomimetic structures.

Funding: SURE

32. Medial Joint Space Width Can Be Reliably Measured During the Anterior Medial Rotation Test

Seth Jude (Delbarton, WV)

Institution: Marshall University
Field: Health Sciences (Biomedical)
Faculty Advisor: Mark Timmons

Context: The anterior medial rotation stress (ANTMED) test is used to determine the frontal and transverse plane knee stability. The purpose of this investigation was to determine the reliability of the measurement of the medial joint space of the knee during the ANTMED test.

Methods: Fifty participants without a history of medial knee injury were included in the study. The medial joint space width (MJSW) was measured via ultrasound images of the medial knee during the ANTMED test. Two measures of the medial joint space width were made in the unstressed and stressed condition during the ANTMED test. The intraclass correlation coefficient (ICC), standard error of measure (SEM), and the minimal detectable change (MDC) were calculated for the joint space width measurements.

Results: The MJSW in the unstressed condition was 7.42±1.28mm (right knee) and 7.95±1.39mm (left). In the stressed condition, the MJSW were 10.20±1.69mm (right) and, 11.49±1.74mm (left). The ICC values were 0.876 and 0.811 in the unstressed condition and 0.847 and 0.768 in the stressed condition. The mean SEM was 0.529mm in unstressed conditions and 0.751mm in stressed conditions. The mean MDC was 0.749mm in unstressed conditions and 1.06mm in stressed conditions.

Conclusion: The results show that the measures of MJSW during the ANTMED test can be measured reliably and with acceptable measurement error. The differences between stress conditions are greater than the MDC. Future work needs to determine the reliability of the ANTMED test in patients with a medial knee injury.

33. The protective effects of exercise on cerebral ischemia injury in diabetes.

Smara Sigdel (Huntington, WV)

Institution: Marshall University
Field: Health Sciences (Biomedical)
Faculty Advisor: Ji Bihl

Ischemic stroke (IS) causes neurological dysfunction by restricting cerebral blood flow; diabetes exaggerates this damage. Further, exercise benefits the vascular system and controls diabetes by mediating inter-organ communications. However, whether and how exercise contributes preventatively to the brain after IS in type 2 diabetes (T2D) is undefined. We aim to determine the effects of exercise on metabolism, brain injury, and cerebral protein expression following IS. T2D mice (db/db, 7-8 wks) and age/sex-matched controls (db/c) were subjected to exercise (10 m/min, 5 days/wk for 8 wks) or sedentary. Body weight and blood glucose were recorded weekly. After, middle cerebral artery occlusion surgery was performed to induce IS; we measured infarct size in collected brain samples using cresyl violet stain. Protein abundances in the ipsilateral and contralateral sides were measured using Western Blot. Proteins included endothelial nitric oxide synthase (eNOS), neuronal NOS (nNOS), NADPH oxidase (Nox2), Nox4, nuclear factor-kappa B (NF-κβ), and NF-κ light polypeptide gene enhancer in β-cells inhibitor, alpha (Iκβα). We found: 1) exercise could stabilize blood glucose in male db/db mice and prevent blood glucose increases at early ages of female db/db mice; 2) exercise decreases infarct size in db/c (18.5 ± 2.2% and 22.2 ± 2.5%) and db/db mice (25.6 ± 3.1% and 35.6 ± 3.8%, exercise vs. sedentary, $p < 0.05$); 3) exercise modulates cerebral proteins related to oxidative stress and inflammation in diabetic IS mice. In conclusion, exercise could provide protective effects by stabilizing metabolism and reducing cerebral injury by modulating inflammatory and oxidative stress-related cerebral proteins.

Funding: American Heart Association, NIH

34. Development of a Rapid, Portable, and Inexpensive Biosensor Device to Detect Sepsis

Tessa Gardner (St. Albans, WV)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Masudur Rahman

Sepsis is an infection in the patient body that could drastically progress without being identified and is one of the leading causes of death in the United States, with nearly 270,000 fatalities out of 1.7 million adult cases per year. Sepsis can begin from what seems like a small, nonfatal infection; it is often underestimated and can quickly develop throughout the body. Timely treatment for sepsis is critical for the survival rate of the patient. Since there is no single diagnostic test for sepsis and most require in-hospital blood lab testing, a portable, non-experienced user-friendly test device is needed. The use of an at-home-or-on ambulance rapid test (like the Covid-19 quick test kit) will eliminate the time required to reach the hospital, go through check-in and triage, and wait for the blood test results to return from the lab before beginning IV antibiotic treatment. Our motivation is to development of a rapid, portable, and inexpensive biosensor device to detect sepsis. Interleukin-6 is a pro-inflammatory cytokine and anti-inflammatory myokine protein. It is produced in response to inflammation. Most often, inflammation at the site of an infection is one of the beginning steps toward a possible case of sepsis. Therefore, in instances of severe infection, IL-6 should hypothetically be a positive marker for sepsis when it surges within the bloodstream. This study will establish a real-time IL-6 protein blood test using the Lateral Flow Assay (LFA) method and find an affordable test kit to expedite sepsis detection and save lives. The long-term goal is to validate our improvement for industrial applications.

35. Identifying Characteristics of Drug Molecules That Suppress Inflammation in the Body Using Computational Methods

Bryan Ho (Martinsburg, WV)

Institution: West Virginia University
Field: Sciences (Chemistry)
Faculty Advisor: Blake Mertz

Respiratory diseases are prevalent health problems that affect over 500 million people globally. In a variety of respiratory diseases such as asthma, lung cancer, and chronic obstructive pulmonary disease (COPD), inflammation in the body leads to escalated development of these diseases. In order to suppress the inflammatory response in the body, key pathways were identified that play a major role in the inflammatory response. The major pathway is regulated through the platelet-activating factor receptor (PAFR). By suppressing the activation of PAFR, inflammation in the body can be reduced. In order to find a small drug molecule that can inhibit PAFR, computational docking simulations have been performed in order to find a molecule that binds efficiently to the receptor. From a library of 50,000 small molecules, each molecule was virtually docked onto PAFR to determine the binding potential and common binding characteristics. From the simulations, it was found that certain characteristics of a molecule lead to specific binding to PAFR. Also, from the docking simulations, a few molecules were identified to be potential drug molecules that could potentially be used for preclinical trials.

Funding: Arnold and Mabel Beckman Foundation

36. Preparation and physical properties of dyes based on 2H,10H-anthra[1,9,8-c,d,e,f]-2,7-naphthyridine-1,6,11-trione

Darshan Sangani (Charleston, WV)

Institution: Marshall University
Field: Sciences (Chemistry)
Faculty Advisor: John Markiewicz

Little is known about 2H,10H-anthra[1,9,8-c,d,e,f]-2,7-naphthyridine-1,6,11-trione or its derivatives. This prompted the investigation of the physical properties of new thioether-based derivatives. Using a method developed by Kondoh et al, SNAr reactions were conducted to substitute various thioethers onto the molecule. Cyclic voltammetry, HRMS, 13C NMR, 1HNMR, IR, and UV-Vis spectroscopy were conducted to examine the properties of the thioethers. The electrochemical properties, structure, dye capabilities, and composition were the primary physical properties examined by these tests. More physical properties will be examined in the future with these new molecules to determine more possible uses. The products have good solubility in a variety of organic solvents, and significant molar absorptivity values, indicating dye potential. Other possible uses may include sensors, medicine, organic electronic devices, dyes, and pigments.

Funding: NASA Marshall; Creative Discovery

37. Characterization of Superhydrophobic Polyallylamine/Teflon Coating on Metallic Substrates

Emily Henry (Beckley, WV)

Institution: West Virginia University Institute of Technology
Field: Sciences (Chemistry)
Faculty Advisor: Tarek Farhat

The polyelectrolyte polyallylamine hydrochloride (PAH) and microparticles of polytetrafluoroethylene (PTFE) are used to deposit a superhydrophobic ultrathin coating on metals. The PAH is a highly diluted solution while the PTFE is a 10% colloidal solution. The substrates used are stainless steel 304 mesh, carbon steel, and aluminum mesh. A bilayer is deposited starting with PAH to functionalize the metal surface followed by a capping layer of PTFE microparticles to obtain a corrugated surface of low surface energy. The combined effect of the metallic mesh structure, PTFE microparticles, and PTFE low surface energy leads to a superhydrophobic coating on the metal surface. Contact angles up to 168.18° were measured and the mesh was able to hold a hydrostatic height of 40 mm. Our research has applications in the coatings industry that serves corrosion protection, filtration, aqua systems, and others.

38. New Sustainable Solvent for Hesperidin Extraction

Kelly Mills (Beaver, WV)

Institution: West Virginia University Institute of Technology
Field: Engineering (Chemistry)
Faculty Advisor: Gifty Osei-Prempeh

Citrus fruits, such as oranges, lemons, limes, and tangerines, are cultivated and consumed all over the world. The high utilization of these fruits in the citrus-processing industry generates large amounts of waste every year. The waste produced as byproducts of the fruit are typically burned which produces CO2 and other harmful gasses. The waste of these fruits is of vast economic value as they contain an abundance of different flavonoids, sugars, essential oils, and polyphenols. Hesperidin is a flavonoid glycoside found in the peels of citrus fruits.

Hesperidin has medicinal and therapeutic properties; it is an antioxidant, anti-inflammatory, antiallergic, anticarcinogenic, antimicrobial, and cardioprotective. With the economical market growing for hesperidin, a sustainable extraction process is key. Many studies have been conducted to find different ways to extract hesperidin from citrus peels, most commonly alkaline, dipping, percolation, and reflux extraction. The success of separation depends upon the correct choice of solvent. Some solvents that provide good extraction are now being categorized as harmful to the environment. This project considers multiple solvents then evaluates them by comparing their safety, health, and environmental parameters as well as the solubility properties of hesperidin.

The presentation will focus on the selection of the best green solvent that provides the highest yield of hesperidin product based on the evaluation process. The process designed for hesperidin production using the selected green solvent will also be presented.

39. CHARACTERIZATION OF 4-PYRONE THERMAL DECOMPOSITION PRODUCTS VIA MATRIX-ISOLATION FT-IR

Khaled El-Shazly (Huntington, WV)

Institution: Marshall University
Field: Sciences (Chemistry)
Faculty Advisor: Laura McCunn

The characterization of the byproducts of biomass thermal decomposition is a critical part in the development of viable clean biofuels and renewable energy sources. 4-pyrone, (IUPAC name: 4-pyran-1-one) is one of the byproducts observed in the thermal decomposition of many forms of biomass, such as wood chips, straw, and cotton husks, but little research exists on its own decomposition pathways, and, consequently, its environmental impact. Using the technique of argon matrix-isolation Fourier-Transform Infrared (FT-IR) spectroscopy, the thermal decomposition products of 4-pyrone were characterized by passing a diluted sample of 4-pyrone through a heated pyrolyzer tube onto a cold window that captures the products and allows for their analysis spectroscopically. Computational analysis using Gaussian 09 software was also utilized to predict relevant structures, transition states, reaction steps, and energies, and these results were compared to the experimental spectra for product identification. Current data collected at decomposition temperatures ranging between 900 K (627 °C) and 1400 K (1127 °C) indicate the formation of acetylene, vinylacetylene, propyne, carbon monoxide, ketene, and methylketene. The formation of formylketene is also likely, as some peaks have been observed that match computational predictions and experimental data on its pyrolytic precursor. The results of this project will be crucial in guiding the development of 4-pyrone-containing biofuels in industrial settings.

Funding: NASA WVSGC

40. Agent Orange: Vietnam War

Megan Kline (Mount Savage, MD)

Institution: Potomac State College
Field: Sciences (Chemistry)
Faculty Advisor: Roshan Lamichhane

The Vietnam War occurred in the Republic of Vietnam from 1961 to 1971 in southeast Asia. Because of the dense jungle foliage/vegetation of Vietnam, American troops could not track the movement of the North Vietnamese Army. To combat this, the American military sprayed millions of gallons of "tactical" herbicides to destroy the forests. One such herbicide used was Agent Orange. This herbicide was a 50-50 combination of 2,4-D and 2,4,5-T, which are highly toxic. The exposure to these chemicals and the dioxin derivatives produced during the manufacture of these chemicals caused various short-term and long-term illnesses in many people who “fought” in the Vietnam war. The number of deaths linked to Agent Orange is ambiguous. However, between 2.5 and 4.8 million people in Vietnam and hundreds of thousands of US soldiers were exposed to Agent Orange. The exposure continues to affect veterans, both in the US and Vietnam, and also the environment today.

This presentation outlines the development of a case study on "Agent Orange" that is based on real-life events. We developed a curriculum for a first-semester general organic chemistry course that includes a video, the case, and an assessment. The aim is to contextualize "Agent Orange" to chemistry concepts that the students are familiar with. In the future study, after presenting the case to first-year organic chemistry students, we plan to report the challenges of classroom management, and some of the misconceptions unearthed from students' artifacts.

41. Aqueous Metal Ion Extraction : Manganese (II), Nickel (II), Copper (II)

Tyler Walker (S Charleston, WV)

Institution: West Virginia State University
Field: Sciences (Chemistry)
Faculty Advisor: Earnest Sekabunga

Heavy metal contamination of water, the cause of which may be anthropogenic or natural, is an important environmental problem. Water discharged as result of coal mining activity, referred to as acid mine drainage (AMD), is acidic and laced with metal ions; such as those of iron, manganese, and aluminum. A common technique of removing pollutant metal ions from water is precipitation, which involves the formation of insoluble metal compounds that fall out of solution. We investigated the green extraction of metal ions from aqueous solution utilizing monoamine-, diamine-, and triamine-functionalized silica gels.

The initial molar concentrations of the aqueous metal salt solutions were determined by complexometric titration using the disodium salt of EDTA. The solutions were stirred with the functionalized silica gel ligands in varying metal ion : ligand ratios. After filtering the final metal ion concentrations were determined by EDTA titration. Metal ion extractions of up to 99% with metal ion : ligand mole ratios of 1:4 were achieved. The acidity of all the treated solutions was less than that of the initial solutions.

The mechanism of metal ion extraction from aqueous solution – precipitation as hydroxide versus complexation – was qualitatively investigated with the Cu^{2+} and Ni^{2+} ions.

Funding: West Virginia State University: Title III Programs

42. Exploring Publicly Accessible Automatic External Defibrillators on West Virginia University's Campus

Abbey Clark (Clarksburg, WV)

Institution: West Virginia University
Field: Health Sciences (Community Health)
Faculty Advisor: Erin Jordan

More than 356,000 people experience out-of-hospital cardiac arrest in the United States yearly, and only about 8% of people survive. Sudden cardiac arrest is a leading cause of death in the United States, affecting around 1,000 people of all ages every day. The objective of this project was to investigate the accessibility of automatic external defibrillators (AED) in classroom buildings on West Virginia University's Evansdale and Downtown campus. After obtaining a campus map a spreadsheet was created using a list of all classroom buildings on campus. Then the investigator walked through each building and documented if an AED was present and accessible. After the walkthroughs, it was found that there were only 3 classroom buildings with AEDs on the Downtown Campus and 6 classroom buildings on Evansdale with an AED. In West Virginia there is no law requiring that AEDs be accessible in schools. West Virginia only requires AEDs to be present at athletic events and practices, under The Alex Miller law. Cardiac arrest is not selective to those of a certain age or health status, seeing as more than 7,000 children under age 18 experience cardiac arrest every year. Most cardiac arrest cases happen outside of a hospital, and most children spend a majority of their day at school and adults at work. So, it is crucial that AEDs be accessible where people spend a majority of their time.

43. Sentiment Analysis of Sports based on Gender and Language

Brianna Higgins (Clendenin, WV)

Institution: University of Charleston
Field: Technology (Computer Science)
Faculty Advisor: Vincent Smith

Gender inequality is among the most contentious issues in sports today. Along with participation and opportunity, there is pay inequality. Over the years, society has decreased the gender gap; however, the gap is still there. Despite the enactment of Title IX, concerns over inequality in lack of airtime for women sports, excessive sexism, discrimination, and disrespect toward female athletes and sports professionals continues to rise. The goal of this study is to analyze how individuals feel about female and male sports to comprehend differences in sentiment. The coding language R was used to collect text data on the topics of male sports and female sports from the social media website Twitter. Data was then cleaned, and sentiment was determined by using a sentiment dictionary in R. Furthermore, for a more worldwide understanding of the sentiment, Tweets were collected in English and Spanish. The differences of languages, particularly in an informal context like social media, could demonstrate substantial variation in sentiment.

44. Design of Path Planning Algorithm for Nursing Robotics

Dakota Walker (Bancroft, WV)

Institution: West Virginia State University
Field: Technology (Computer Science)
Faculty Advisor: Heng Wu

A growing problem is sweeping the nation of an elderly population that is being left to live on their own even if it may put said elderly people at risk. This research will go in depth on one possible solution in the form of a robotic companion. While there may be research into some forms of a robotic solution a lot of these options are extremely expensive or have very limited functionality, such as only being able to engage in simple conversation. This research goes into some of the core concepts of robotics systems that will become essential in future development of complete robotic campinion. This research goes into the construction, programming, and development of the machine learning component and how this all comes together to create one complete prototype unit.

Funding: NASA

45. A comprehensive survey of deep learning algorithms in digital pathology

Hannah Vitalos (Inwood, WV)

Institution: Marshall University
Field: Engineering (Computer Science)
Faculty Advisor: Sanghoon Lee

With the advance in technology, deep learning algorithms have become increasingly popular in various artificial intelligence problems such as image recognition, object detection, and image classification. Especially, deep learning algorithms have seen wide use in medical image analysis because of their capabilities to assist physicians by diagnosing diseases or detecting patterns in patient health information. In the field of digital pathology, image analysis, when done by hand, can be an arduous and time-consuming task, thus many deep learning algorithms have been applied to assist medical professionals in these tasks since as early as the 1970s. However, previous survey of deep learning algorithms in digital pathology has been limited to providing only specialized algorithms based on the methodological aspect of various deep learning strategies. Although there are few surveys describing state-of-the-art deep learning algorithms, they are still focused on one specific cancer type. During the last several years, deep learning algorithms, specifically convolutional neural networks, have emerged as new methods to provide this assistance. In this abstract, we provide a comprehensive survey of deep learning algorithms in digital pathology. We first categorize studies based on the various cancer types and then explain their methodologies including image analysis, deep learning algorithms, and their applications. Last, we discuss some open issues or problems in the recent studies.

Funding: National Science Foundation

46. Virtual Reality Museum Application for the Arts

Joshua Maddy (South Charleston, WV)

Institution: Marshall University
Field: Technology (Computer Science)
Faculty Advisor: Husnu Narman

Many people are monetarily and or physically inhibited from visiting private, or even public institutions. This project, The Metaphysical Exhibit, aims to give all ages a modern, technological take on the museum experience by providing a Virtual Reality alternative. By lowering the barrier of entry to a one-time purchase for the hardware and free software, any classroom or consumer can experience master works in an immersive environment. By compiling public information on historic works, a rich collection of art pieces across the eras can be displayed under one roof. Utilizing Virtual Reality, the museum is easily distributed and portable. It can be deployed on any capable hardware and shared without restriction. The application is proposed as a packaged experience capable of running on modern headsets, specifically the Meta Quest 2.

The primary question is whether the proposed approach to VR museums is viable in a classroom and personal setting. The questions that will be used to justify the conclusion are as follows: (I) Does experiencing the museum in this format feel analogous to prior exhibit experiences? (II) What is the level of interest in exploratory, self-guided VR content used in education, from both a student and teacher perspective? (III) How can the experience be improved? It is anticipated that this project will be received positively by both students and teachers as an introductory experience for the arts.

Funding: Marshall University Research Corporation

47. Predicting Timing and Location of HABs on the Ohio River using Machine Learning

Miranda Simpson (Lesage, WV)

Institution: Marshall University
Field: Engineering (Computer Science)
Faculty Advisor: Sanghoon Lee

Harmful Algae Blooms (HABs) are excessive growths of algae that occur when the algae in a body of water grow out of control, mainly due to the overloading of nutrients such as phosphorus and nitrogen. Stormwater runoff from nutrient-rich soil flows into receiving water bodies, where algae feed on the nutrients and grow rapidly, causing the water to produce toxins that can cause sickness in animals and people who consume the water. The water quality along the Ohio River has been impacted by frequent HABs. HABs negatively affect people who rely on river water for drinking and recreational purposes. Although many contributing factors related to the formation of HABs are known, forecasting the timing, location, and magnitude of HABs in the Ohio River has been challenging. Our research project explores machine learning-based approaches to predict HABs in the Ohio River using publicly available data published by the Ohio River Valley Water Sanitation Commission (ORSANCO). One of the machine learning algorithms will be adopted to accurately forecast HABs by analyzing the cause and effect of multiple environmental parameters. Especially, our study will advance HABs studies by analyzing the relationship between chlorophyll and three parameters: nitrogen, phosphorus, and temperature as well as exploring other parameters such as flow rate, biochemical oxygen demand, and fish population.

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

48. Interactive multimodal cancer data integration on histopathology and radiology

Nicole Adkins (Barboursville, WV)

Institution: Marshall University
Field: Engineering (Computer Science)
Faculty Advisor: Sanghoon Lee

Cancer is the deadliest disease and one in three people develop cancer during their lifetime. Many efforts have been done to treat cancer, but standardized therapies have been limited because cancers generally become more complex and heterogeneous. In recent years, there has been an increase in studies applying machine learning algorithms to tumor cells for cancer immunotherapy, improving the outcomes of patients with various cancer types. However, most studies have focused on unimodal cancer immunotherapy without considering multiple treatment options. Although few researchers studied these multiple treatment options by integrating their multi-modal data analysis, it has been limited to determine the optimal integration of multimodal cancer data. In this abstract, we propose an interactive multimodal cancer data analysis framework that integrates radiology cancer data with histopathology cancer data enabling researchers to actively update heterogeneous features extracted from multimodal cancer data in a loop. Radiological segmentation and histopathology segmentation will be done in the MSK dataset (Lung Adenocarcinoma) from 247 patients. To validate our framework, AUROC (Area under the receiver Operator Characteristic) curve. In most cases, multi-modal learning is used when combining features from different formats, therefore it would be used to unite different analysis techniques to get a detailed understanding of the cell. We expect to have a higher degree of AUROC results and to improve cancer immunotherapy.

Funding: National Science Foundation

49. Efficient Interprocess Communication in a Multi-Threaded Environment

Noah Quesenberry (Herndon, WV)

Institution: West Virginia University Institute of Technology
Field: Technology (Computer Science)
Faculty Advisor: Somenath Chakraborty

Processes, instances of currently executing computer programs, often need to communicate with each other in the system to perform various functions. Communicating processes that directly affect each other when sharing resources and data are known as cooperating processes and to efficiently communicate, these processes need a mechanism known as Interprocess communication. A cooperating process environment without an interprocess communication mechanism can lead to deadlocks where two processes are in a stalled state while they wait for a process to give up access to a resource or a race condition in which both processes are attempting to access the resource at the same time. Utilizing interprocess communication, we can effectively utilize cooperating processes to ease our computer's workload by offering a dive-and-conquer approach, promoting greater computing speeds. In this project, we are introducing an effective inter-process communication mechanism that is implemented in a multi-threaded environment with interprocess communication. Using shared memory for thread instances, we can make the process of interprocess communication as efficient and effective as possible. Shared memory’s one-time process of allocating the memory is the only time penalty no matter how many times processes access the memory, whereas message sharing must make two system calls, a read, and a write system call, for each data exchange (OpenCSF, n.d.). Shared memory's only pitfall is the issue of synchronization; however, by using the POSIX semaphore interprocess communication can be implemented safely and efficiently in a Linux-based operating system.

50. Virtual simulation aided AI model for non-invasive fish detection in a Recirculating Aquaculture System

Sullivan Steele (Charleston, WV)

Institution: Shepherd University
Field: Technology (Computer Science)
Faculty Advisor: Rakesh Ranjan

The recent advancements in machine learning (ML) have drawn the interest of the aquaculture industry and research community. ML-assisted image classification and object detection can be utilized in the aquaculture industry for tasks including feed optimization, biomass and yield estimation, checking for disease, and waste management. However, ML approaches are data-intensive and model precision and accuracy primarily depend on the data quality. Under recirculating aquaculture systems (RAS), high fish density and water turbidity produce major challenges to acquiring high-quality imagery data. Additionally, manual data annotation is a time-consuming and labor-intensive process that can hinder the implementation of ML in the aquaculture industry. Therefore, the goal of this project was to utilize virtual simulation to aid in training an ML model for robust in-tank fish detection without using an underwater camera. Pertinent to this, a simulated tank environment was created in Blender, an open-source 3D modeling and rendering software. The boid particle systems were used to simulate fish movement in the tank. Furthermore, advanced node shading was utilized to mimic the typical murkier water appearance. Fish were also individually animated to create variation in fin, mouth, and tail movement. The optimized virtual model was extracted into individual frames, and then rendered out and converted to image, depth, and semantic data to generate a cocojson dataset for training a PyTorch model. The model performance is being evaluated in terms of mean average precision (mAP) and F1-score, then compared against a fish detection model trained with image data collected in a RAS.

Funding: The Freshwater Institute

51. Audacious Women: Societal and Environmental Impacts on Women through Dance

Elena Maddy (Peterstown, WV)

Institution: West Virginia University
Field: Creative Arts (Creative Arts)
Faculty Advisor: Yoav Kaddar

Throughout time, women have borne their children along with the brunt of society's pressures, changing with each decade's new rules, including those that define who does and does not qualify as a woman. We are adding our voices to the researchers and dissenters of these societal rules and creating a space for women to feel seen and heard, while also educating those who do not identify as women on the daily struggles women face. We are contributing our findings and experiences through our own medium: dance. Audacious Women is a choreography project that analyzes societal rules imposed upon women and how those rules impact their sexuality, sensuality, and sense of self using modern dance. Modern dance is a genre of dance that focuses on storytelling through organic and abstracted movement. We chose this style of dance because it can be free of gendered movement and possesses theatrical elements, enabling us to utilize our training that combines a BFA degree in Musical Theatre and a BA in Dance. Our research on gendered movement and the female narrative is intended to create a performance that will empower all women in the West Virginia University community. We hope to continue the performance outside of WVU to spread this empowerment to a broader audience. We acknowledge that these issues are a worldwide experience and strive to make a difference in our own community, in order to plant the seed of change.

Funding: Honors EXCEL Program

52. Appalachian Sartorial

Jacob Dial (Milton, WV)

Institution: West Virginia University
Field: Creative Arts (Creative Arts)
Faculty Advisor: Collen Moretz

Through my senior collection I explore my experiences growing up in West Virginia along with the stereotypes the Appalachian people have been cast into. From my findings I have created a cohesive collection that blends classic tailoring with curated influences from Appalachian culture. There is a large focus on the use of natural, regenerative, and reclaimed fibers as sustainability is key for the future of West Virginia. All the looks utilize organic cotton, deadstock wool, organic silk, and reclaimed leather. This is an ode to the rich textile industry that West Virginia once had. The goal of this is to create a collection that is true to my heritage while modernizing the "West Virginia Hillbilly". Through this collection I hope to reclaim West Virginia's stereotypes while advocating for sustainable fashion. This collection is an ongoing work with my main looks being finished in december and accessories being completed in the following months.

53. How to Reduce Fatal Officer-Involved Shootings in the United States

Lindsay Maxwell (Elkins, WV)

Institution: West Virginia University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: James Nolan

Our research looked at fatal officer-involved shootings (OIS) in eight major U.S. cities. Five cities had the highest rates of OIS while the other three had significantly lower rates. Cases were randomly selected from each city, then compared and contrasted against one another. The results of this study suggest that implementing several changes in police departments can greatly reduce the number of OIS. This could be accomplished by equipping officers with body-worn cameras and tasers, along with using new training procedures for mental health calls and other unusual circumstances. This will enable police to be more prepared and have more options available when facing an uncooperative suspect. Furthermore, these tactics will create a more transparent police force that holds officers accountable and will ultimately decrease the rates of OIS. The five cities with the higher rates of OIS also had an extremely high rate of racial disparity among the victims. This issue has become a hot topic in the mainstream culture recently, with nation-wide protests over the brutality African Americans and other minority groups face from law enforcement. Lowering the rate of OIS will, in addition to the preservation of life, have many benefits such as increasing trust in law enforcement, cooperation from the public, and saving billions of taxpayer dollars currently being used on wrongful death settlements.

54. The Fight to Eliminate Injustices Towards Juveniles: A Review of Literature Examining Incarcerated Adolescents

Madison Mann (Morgantown, WV)

Institution: West Virginia University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Amy Kennedy Root

The literature reviewed in this poster will summarize peer-reviewed research articles that explain antecedents of criminal behaviors during adolescence. Previous research indicates that adolescent delinquency can be attributed, in part, to the immature brain of an adolescent, the "age-crime curve," self-concept clarity, and peer influence (Cauffman et al., 2016; Dreyfuss et al., 2014; Levey et al., 2019; Scientist Action and Advocacy Network, 2017).

Additionally, the proposed poster will explore factors within the United States' legal system that are associated with youth incarceration. Previous research indicates juvenile court officials' perceptions of adolescents' families influences their court decisions (Rodriguez et al., 2009). Moreover, poor comprehension of Miranda Rights and criminal responsibility age requirements contribute to incarcerating adolescents (Scientist Action and Advocacy Network, 2017). Race also significantly modifies the chances of incarceration and sentencing durations, with people of color more likely to be incarcerated for longer periods of time (Doerner & Demuth, 2010; Higgins et al., 2013). The evidence outlined in the proposed poster will also underscore the need for rehabilitation, instead of incarceration, as adolescent brains are still developing. Scientist Action and Advocacy Network (2017) explains the adolescent brain is highly malleable, making rehabilitation more probable. Considering the immense prison population in the United States, removing juveniles from behind bars would also lessen the costs taxpayers face (The Second Look Act, 2019). The proposed poster will document findings from previous research to demonstrate an improved comprehension for adolescent criminal acts, biases within the legal system, and using rehabilitation to foster prosocial behaviors.

55. Comparing the Effects of Recidivism: Inside Private and Public Prisons

Timothy Reidell (shinnston, WV)

Institution: West Virginia University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Deanna Brooke-Armentrout

America has a high level of criminal relapse, which could be attributed to private prisons and the fact that they are funded for each inmate in their custody. This gives little incentive to rehabilitate inmates and creates serious problems for society. It raises taxes and crime rates. Additionally, there are several costs to rising crime rates which include, but are not limited to financial, mental, and social. Criminal relapse is complex due to the several definitions—across countries and individual research; however, measuring recidivism (criminal relapse) is outlined in this study by rearrest, reconviction, and reimprisonment. Several factors influence recidivism including age, gender, and criminal history. Private prisons have a long history within the United States which legislatures have had a great impact on through changing laws. Past studies have examined the effects that private prisons have on recidivism. However, caution must be taken interpreting the results of these studies because of the complex nature of recidivism. Although, attempts have been made to lower recidivism few are successful. It would be difficult to remove private corrections altogether because they are so widespread. My research has shown that changing the contracts may prove useful in decreasing recidivism by paying private corrections based on their recidivism rates and giving further incentives by adding bonuses when they reach specific goals. A change in contracts can be achieved by politicians, private prisons, and the bureau of prisons.

56. Mouthguard Utilization among West Virginia University Club Athletes

Alice Salter-Roy (Rockingham, VT)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
The purpose of our research was to help us determine the correlation between mouthguard utilization and West Virginia University collegiate athletes during practice and competition. Our research is intended to increase awareness of the importance of mouthguard usage in collegiate athletes. We hypothesized that collegiate club athletes are not utilizing mouth guards during both practice and gameplay.

Methods and Materials
To attain our results, a Qualtrics survey to over 210 West Virginia University club sports athletes was distributed.

Results and Discussion
Over 110 athletes responded to our Qualtrics survey. We had a 52.4% response rate. In our survey we were able to determine the age, gender, sport, utilization, and type of mouthguard worn by the collegiate athlete. We found that 44.55% of club athletes wear mouthguards during competition, 46.36% don't utilize mouth guards during competition, and 9.09% of athletes sometimes wear mouth guards during competition. We found that 23.64% of athletes wear mouthguards during practice, 62.73% don't utilize mouthguards during practice, and 13.54% of athletes sometimes wear mouthguards during practice. With that being said, boil-n-bite was the most popular type of mouthguards worn by WVU club athletes.

Conclusions and Recommendations
Men's ice hockey had the least mouthguard utilization in both practice and competition. While women’s field hockey had the greatest mouthguard utilization during practice. Lastly, lacrosse had the greatest mouthguard utilization during competition.

57. The Connection Between the Use of Dental Floss and Bacterial Transfer

George Harris (Waverly, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
The purpose of this study is to quantify the bacterial transfer that occurs while using floss, when utilizing both rotating and non-rotating techniques. We hypothesized that utilizing a clean section of floss between each tooth leads to decreased bacterial transfer, and the use of floss without utilizing a clean section of floss between each tooth leads to increased bacterial transfer.

Methods and Materials
100µL of Streptococcus mutans was reconstituted to concentration of 1.0x10^6 cfu/mL.
Simulated tooth #15 from six models was placed in bacteria for 48 hours, at 37°C. After returning to the models, the non-rotating trials began. Floss was activated in each interproximal space, using a floss holder. Surfaces were swabbed and placed in vials containing 1mL of 0.85% sterile saline. Steps were repeated using the rotating technique, and a total bacterial count of each interproximal space was conducted via flow cytometry.

Results and Discussion
Biostatistical analysis revealed there was no significant difference in mutans between the rotating and non-rotating groups ($p= 0.6686$). However, there was a significant difference across the positions ($p= <0.0001$). The interaction between position and mutans did not differ significantly between the rotating and non-rotating groups ($p= 0.3415$).

Conclusions and Recommendations
The results showed no significant difference in flossing techniques, but both techniques showed a decrease in bacterial transfer. Using models that don't have voids at the simulated cementoenamel junction and increasing sample size could prevent contamination and increase significance, respectively.

58. The Effect of Chewing Xylitol Gum on Plaque Score

Haley Liu (Morgantown, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction

Residual plaque in the mouth can cause cavities and periodontal disease over time without adequate oral hygiene. This study analyzes the effectiveness of chewing gum on reducing plaque score so that we may recommend chewing gum as an adjunct cleaning aid. The hypothesis is chewing xylitol gum for ten minutes will have a 10% reduction on plaque score.

Methods and Materials

A convenience sample of 22 junior and senior dental hygiene students was used. Participants' medical history, dental, tobacco and alcohol, and eating habits were collected. Using disclosing solution on a cotton tip applicator, each participant was disclosed before and after chewing gum. Type of gum, stick and pellet, was assigned to participants based on H-number. Plaque score was recorded using a 0-3 scoring system per tooth surface. Using a chi-square test, the p-value was calculated to determine a significance of 0.00000019335.

Results and Discussion

Results yielded an average plaque reduction of 5.26%. Participants taking medications were not seen to have significant differences in plaque reduction compared to individuals not taking medications. Tobacco use was concluded to have an impact on the efficacy of chewing gum, as 3 out of 4 users' scores placed one standard deviation below the mean. Type of gum didn’t play a significant role in plaque reduction.

Conclusions and Recommendations

The study concludes that chewing gum has an effect on reducing plaque score. Recommendations include using a wider sample, non-hygiene students, manual toothbrush users, a non-xylitol variable, and different chewing times to have a greater understanding of these variables.

59. Relationship of Periodontal Disease and Tobacco Usage Retrospective Review

Hannah Duba (Accoville, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
Tobacco products contain life threatening, addictive, cancer-causing chemicals which have negative effects within the oral cavity. The study was conducted to determine current tobacco users' periodontal status to non-tobacco users' periodontal status. The aim was to investigate the three periodontal classifications: Healthy, Gingival Disease, and Periodontal Disease. This research is important to affirm knowledge concerning long term usage of tobacco products yielding in a higher periodontal classification.

Methods and Materials
Health Insurance Portability and Accountability Act and Data Protection Form completed to allow access to files for 200 patient charts. WVU School of Dentistry patient population utilized. Information gathered from Axium software patient information computer database through WVCTSI assistance. Tobacco Questionnaire and Counseling forms utilized to receive data. Data was converted into a Microsoft Excel sheet for Chi-squared manipulation.

Results and Discussion
The results found that 19 non-tobacco users had a "healthy" periodontal classification compared to 14 patients in the tobacco group. 45 patients in the non-tobacco group were found to have gingival disease compared to 40 patients in the tobacco group. For the primary endpoint, it was found that 36 patients in the control group had periodontal disease compared to 46 patients in the tobacco group ($p=0.321$).

Conclusion and Recommendations
No significant association between periodontal disease and tobacco usage; therefore, the null hypothesis stating tobacco users will not display a higher periodontal classification compared to non-tobacco users was proven. A recommendation is made to rather charts from only dental hygiene students to utilize consistent charting and correct periodontal classifications and expand patient sample outside of WVU School of Dentistry.

60. Toothbrush Protector or Bacteria Collector?

Kayla Clark (Parkersburg, WV) and Darcie Trotter (Scott Depot, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
Individuals have a tendency to store toothbrushes in closed containers such as caps, cases, and plastic bags that can initiate bacterial growth and expose the oral cavity. We hypothesize that bags will accumulate the highest bacteria count.

Methods and Materials
Obtaining IRB#2208637665 and IBC#22-09-01 approval. Recruitment of 24 participants who were assigned a new toothbrush and a cap, case, or plastic bag for storage for 2 weeks. The toothbrush holders were collected following the trial. Each unit was swabbed with 4 cotton tips and placed in 3 mL of saline, then sonicated and vortexed. Two 1 mL samples of each holder were aliquoted into 5 mL conical tubes. All samples were prepared using Invitrogen's Molecular Probes Bacterial Counting Kit, then transported to Flow Cytometry analysis.

Results and Discussion
After participants stored toothbrushes for two weeks, the results suggest that there is a significant difference in total bacterial accumulation across the three groups ($p < 0.0001$). In comparison of all toothbrush containers, significant differences were found when comparing the Cap Vs. Bag ($p < 0.0002$) and the Case Vs. Cap ($p < 0.0001$). No significant difference was found when comparing Case Vs. Bag.

Conclusion and Recommendations
A larger sample size needed to detect a significant difference due to the large variation among the case data. In conclusion, statistical analysis showed a null hypothesis. Bacteria accumulation occurred in all of the covers we tested, however the total bacteria count of the cases averaged was far above the bags and caps.

61. A Survey to Determine The Level of Patients' Anxiety During a Dental Visit by the Professional

Justice Duvall (Inwood, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

INTRODUCTION
A repeating question still arises in dental treatment and it is, “What causes dental anxiety, and what are some of the signs and symptoms displayed?”. Many individuals experience a spectrum of severities of dental anxiety which can lead to the creation of a barrier to treatment and care. An opportunity to explore the displayed dental anxiety signs and symptoms along with determining mediation factors, the hypothesis would state that at least one third of the participating dental professionals will identify through verbal and physical observation the presence of dental anxiety.

METHODS AND MATERIALS
Using Qualtrics, a survey was completed by dental clinicians and students throughout WV and WVU School of Dentistry. Their observation of patient anxiety throughout a dental visit was submitted. Information was selected from a variety of age ranges and classification of treatments ranging from screenings to extractions. An evaluation of anxiety verbal and/or physical signs before/during the treatment were surveyed along with patients’ attitudes.

RESULTS AND DISCUSSION
15.38% displayed physical signs of anxiety with shaking/trembling and dodging motions/items. 30.76% verbally expressed their anxiety with reporting feeling shaky. During 30.76% presented with physical signs with sweating joining the other existing signs. 23.07% admitted anxiety being verbally reported the most.

CONCLUSIONS
The observation of verbal and physical anxiety was not significant. The ideal response rate of 40 subject’s experiences could have made the significance of the results stronger as the hypothesis of one third of patients presenting with dental anxiety was not supported in this study.

62. The Importance of Face Shields in an Oral Healthcare Setting

Kailey Cullen (Charlestown, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
In light of the COVID-19 pandemic, face shields have become more common in dentistry. This investigation determined the effectiveness of face shields based on a total bacterial count obtained from the face shield itself. The hypothesis states that the total bacterial count after a dental hygiene appointment will be higher than the total bacteria count before the appointment.

Methods
To conduct research, 40 face shields were given to 40 dental hygiene students. At the end of each appointment, each face shield was collected, swabbed, and tested for total bacteria count. As controls, 40 new, unused face shields underwent the same testing. Each face shield was swabbed in three separate locations. A bacterial counting kit was then used to prepare samples for Flow Cytometry analysis, which determined the total bacterial count found on the shields.

Results and Discussion
The results reveal a significant difference between bacterial load found on the controls and bacteria load samples found on the exposed shields with a p value of 0.0129. A linear mixed-effects model was employed to find these results.

Conclusion and Recommendations:
In conclusion, the hypothesis was confirmed and shows that face shields are effective in protecting clinicians from bacterial transmission and should be a standard part of PPE. For study replication, a recommendation identifying the bacteria that is present, expanding the sample size to include various dental procedures, and have participants wear the face shield for the total duration of the appointment.

63. The Cariogenic Potential of Sweeteners in Vaping E-Liquid

Savannah Lahey (Charleston, WV)

Institution: West Virginia University
Field: Health Sciences (Dental Hygiene)
Faculty Advisor: Alcinda Trickett Shockey

Introduction
In America, 8.1 million adults are current e-cigarette users. Limited studies have been conducted researching the effects vaping has on the oral cavity. Our research investigated whether different sweeteners in vaping solutions (VG/PG, erythritol, ethyl maltol, and sucralose) affected Streptococcus mutans growth, the bacteria responsible for dental caries. We hypothesize that the higher carbohydrate sweeteners, erythritol and ethyl maltol, will have a significant effect on S. mutans growth compared to VG/PG and sucralose.

Methods and Materials
Four e-cigarettes containing each sweetener, were diffused separately into BHI broth utilizing the vape diffuser, simulating 100 puffs. The four solutions were then placed into a sealed Pyrex bottle. S. mutans were then diluted into each broth utilizing the McFarland test. The bacteria containing vape solutions were each pipetted into a 96 well plate. The plate was placed into a spectrophotometer at 620nm to receive an initial reading and placed in a 37˚C incubator between readings. A linear mixed-effects model was employed for statistical analysis.

Results and Discussion
The results reveal a significant difference in S. mutans between groups and difference in growth as time increased. Sucralose was found to significantly inhibit S. mutans growth. Each of the other solutions are not statistically significant when compared.

Conclusions and Recommendations
The hypothesis was not supported as the results showed that the sucralose solution was found to be the only solution to have a significant effect on S. mutans growth. If repeated, incorporating nicotine would be beneficial for future researchers.

64. Assessment of Mammalian Diversity in Kanawha State Forest Using Trail Cameras

Karlie Hill (Liberty, WV)

Institution: West Virginia State University
Field: Sciences (Ecology)
Faculty Advisor: Karlie Hill

On June 10 th through July 27 th , ten trail cameras were set up at six different sites for a total of six weeks. The Kanawha State Forest staff helped us travel to different sites that they thought were ideal for our cameras to capture the most wildlife activity. Observations were taken at these sites such as game trails, feces, bedding, etc. These observations helped us decipher where to place our cameras, for they were shown to have the most mammal activity. These cameras were set up at one site and left for one week. After one week, the cameras were taken down and data was collected. Once the data was gathered, the cameras went back up the next day or the same day to a new site. During the week, the pictures were looked at and each mammal was assessed and charted in a lab book. There were several mammals captured on camera such as, deer, bear, bobcats, coyotes, and more. The number of bobcats and bears that we captured were the most interesting aspect of this research.

Funding: NASA

65. Temperature, Oxygen, and Vegetation as Drivers of Microbial Dynamics in Warming Peatlands

Teagan Kuzniar (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Ecology)
Faculty Advisor: Ember Morrissey

Peatlands, a type of wetland, have slow rates of organic matter decomposition due to the water-saturated and oxygen-limited environment. This causes the accumulation of organic carbon and sequesters atmospheric carbon dioxide. Climate warming is predicted to cause increased greenhouse gas emissions from peatlands due to increased rates of microbial metabolism and organic matter decomposition. This is expected to cause a shift in dominant vegetation with a decline in Sphagnum mosses and an increase in Polytrichum mosses. However, little is known as to how vegetation and temperature affect microbial functioning in wetland environments in the presence and absence of oxygen. To investigate these questions, we conducted a warming experiment in both the presence and the absence of oxygen using soil associated with Sphagnum and Polytrichum mosses from Cranberry Glades, West Virginia, USA. Based on soil properties, biomass, and respiration measurements, we found that microbial responses to temperature are dependent upon oxygen availability, and respiration is dependent on plant species and temperature. This indicates that precipitation changes associated with climate warming, which alters oxygen availability, may determine soil carbon responses to temperature. Additionally, the decrease in microbial biomass along with the increase in microbial respiration could lead to a loss of carbon from wetlands into the atmosphere. This reinforces the idea that carbon is being lost from these ecosystems in warming conditions. The interaction between microbial functioning, temperature, oxygen availability, and vegetation provides valuable insights as to how these ecosystems will respond to climate change on a larger scale.

Funding: West Virginia University

66. Investigating the Impact of Cultural/Regional Bias Upon Pre-Service Teachers' Perceptions of their Academic and Professional Abilities

Joshua Lovejoy (Hurricane, WV)

Institution: West Virginia State University
Field: Education (Education)
Faculty Advisor: Elisha Lewis

Our research began with an awareness that arose in the education department at West Virginia State University when several students reported perceptions of being treated differently based on their dialect, which they felt negatively impacted their overall performance in the course. A Likert-style survey was distributed in Google Forms to students to determine their perceptions of how their geographic Appalachian region impacted their education as it related to their community (rural, urban, suburban), dialect, and race/ethnicity.

The findings revealed that 20.7% of students perceived the geographic region in which they were born/raised impacted the way they were treated by professors, with 37.5% perceiving this to be a negative impact on their overall performance or grade in the course. Also reported by 27.6% of participants was the perception that there were presumptions about them based on their dialect, and 31% reported the perception that presumptions were made about them based on their race or ethnicity. Additionally, 55.2% of students perceived that their experiences would be different if they lived in or were from a different geographic region.

Limitations of this data included the high number of respondents from urban areas and the fact that 60% of respondents were freshmen, which may have impacted the level of cultural bias they experienced at a collegiate level.

Funding: Peer Grant

67. Identifying Gender Related Differences in Graduate Medical Education with Web-Based Professionalism Monitoring Tool

Lauren Imler (Duncansville, PA)

Institution: West Virginia University
Field: Health Sciences (Education)
Faculty Advisor: Manuel Vallejo

Medical education is required to ensure a healthy training and learning environment for resident physicians. Trainees are expected to demonstrate professionalism with patients, faculty, and staff. West Virginia University Graduate Medical Education initiated a web-based professionalism and mistreatment form on our website for reporting professionalism breeches, mistreatment, and exemplary behavior events. The purpose of this study was to identify characteristics in resident trainees who had an activation about their behavior to better understand ways to improve professionalism in GME. This WVU Institutional Review Board approved quality improvement study is a descriptive analysis of GME activations from July 2013 through June 2021. We compared characteristics of all those trainees who had specific button activation(s) about their behavior. Data is reported as frequency and percentage. Nominal data and interval data were analyzed using Chi-square and t-test, respectively. A $p < 0.05$ was significant. Logistic regression was used to analyze those differences that were significant. There were 598 button activations and 54% of the activations were anonymous. 98% were constructively resolved within 14 days. 95% were identified as involving one gender, with 66.3% identified as men and 33.7% as women. Of the 598 activations, 83.7% involved residents and 16.3% involved attendings. One-time offenders comprised 90%, and 10% involved individuals who had previous button pushes about their behavior. Implementation of a professionalism-monitoring tool, such as our web-based activations identified gender differences, as twice as many men were identified as the instigator of a professionalism breach compared to women.

68. Design and implementation of a very low power and high voltage AC power supply for Biomedical applications

Alexa Hoffman (Ona, WV)

Institution: Marshall University
Field: Engineering (Engineering)
Faculty Advisor: Jayanta Debnath

In this project we will design and implement a very low power and high voltage AC power supply for biomedical applications. There are no such power supplies to meet the specific requirements of very low current, high voltage, and a range of frequency operation. As per the biomedical requirements, it is crucial that this design meets the parameters listed above, as the goal is to use this to test the effect of electric filed on the mesenchymal stem cells differentiation. Maintaining a low current while providing a high voltage is necessary to not harm the cells. In our implementation, so far, we were able to produce about 2400 volts (peak to peak) from a 10-volt (peak) supply. We used a module-based implementation technique. Each module produces about 300V from the input. Several of these modules were connected in series to achieve the higher voltage. We used transformers, signal generators, dc-power supply, and operational-amplifiers (OP-amps) in our design. We needed to perform soldering in connecting transformer terminals with other circuit components. An electronic buffer circuit using OP-Amp was necessary to keep the output of the signal generator at constant level. The buffer circuit helps retain the sinusoidal waves necessary for the experimentation on the mesenchymal stem cells. As of now, the power supply is in testing-phase with the biomedical team and in the future, we will be working closely with our Bio-medical team to meet their power supply requirements.

69. Automation In Agriculture

Alexander Flasch (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Guilherme Pereira

In a world dominated by manufacturing, whether agriculture or industry, robotics has been applied to minimize tedious tasks and make them more systematic. This research focuses on the design and development of an interchangeable, cost effective, and efficient gripper for agriculture applications. Using basic machines like a linear actuator and an Arduino uno, a design was created to assist farmers in picking varieties fruit from trees. This gripper connects to an UR3e manipulator robot and can be changed to work in other tasks beyond the original application of this research. The parts are 3D printed to avoid expensive cost and to provide easily replacement in case pieces break from strenuous use. Parts can be printed within a day and sent to the customer shortly after. The design was created and developed on Solidworks using basic geometry. It can be edited and specialized for other specific tasks. This research was tested on spherical objects in a lab environment. The test showed the maximum and minimize the sizes of objects that can be gripped. Code for the gripper can be furthered for more advanced processes, but the current code is sufficient and completes the task in the experiment. The results suggest that this robotics research can be applied to commercial use.

70. Membrane technology for on-board inert gas generation units on aricrafts and space vessels

Alyssa Mize (Hurricane, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Oishi Sanyal

Membranes allow precise- size-based separation between similarly sized molecules in a mixture and have found applications in both liquid (e.g., water treatment/desalination) and gas separation (e.g., carbon capture, natural gas upgrading). Compared to traditional thermal-based separation processes, membranes provide an energy-efficient solution to O2/N2 separation, and the design of appropriate membrane materials and processes could lead to the development of continuous, modular systems. Carbon molecular sieve (CMS) membranes are a promising class of membrane materials, however, there exists opportunities to further improve the productivities of these membranes. My proposed research will focus on developing a completely new strategy to fabricate CMS membranes using microwave irradiation with the goal of increasing the O2 productivity of the membranes, while still retaining attractive O2/N2 selectivity. This research is focused on the development of advanced membranes for modular on-board inert gas generation (OBIGGS) units on aircrafts/spaceships, which is of interest to NASA for flammability reduction. This is a current ongoing research project, and this project branches from the continuing research within the molecular transport and separations lab focusing on the novel strategy of microwave-assisted decomposition, targeted for the very important O2/N2 separation.

Funding: West Virginia NASA Space Grant Consortium

71. Study on compressive strength of Portland cement concrete with activated carbon

Andrew Ball (Huntington, WV)

Institution: Marshall University
Field: Engineering (Engineering)
Faculty Advisor: Sungmin Youn

A series of experiments were performed to analyze the effects of activated carbon on the compressive strength of Portland Cement Concrete (PCC). The experiments were performed using four batches of PCC, each containing 0%, 0.5%, 1.0%, and 2.0% activated carbon-to-cement ratios by weight. Every batch was tested on days 7, 14, 21, and 28, with four cylinders from each being broken and the compressive strength of those breaks being averaged. The results showed that adding 0.5% commercial activated carbon increased the compressive strength significantly compared to the 0% activated carbon mix. The results for the 0.5% activated carbon specimens on the 7, 14, 21, and 28-day breaks showed a compressive strength increase of 28.7%, 22.2%, 26.8%, and 22.9%, respectively. However, after adding more than 1% activated carbon, it was observed that activated carbon had minimal effects or decreased compressive strength compared to the 0% activated carbon results, which agrees with results from other studies. When observing the air content of each sample, adding any amount of activated carbon decreased the air content from 3.6% to around 1.5%. In addition to the observations of compressive strength and air content, fine aggregates and activated carbon surface morphologies were compared using a novel image processing technique. The results indicated that the surface of activated carbon significantly differs from that of aggregates.

Funding: College of Engineering and Computer Sciences, Marshall University

72. Modeling and Extrapolation of PJM Renewable Energy Consumption

Ashley McCullough (Lumberport, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Fernando Lima

As alternative energy becomes increasingly utilized in the US, it is more important than ever that location-specific energy data be accurately estimated to ensure power grid stabilization. Within the eastern US, PJM facilitates electricity transmission throughout Pennsylvania, New Jersey, and Maryland metropolitan areas—many of which have high wind generation potential. The goal of this research is to extrapolate wind generation potential data for a candidate location from a validated nearby wind farm model, and utilize PJM power demand data—collected by an automated MATLAB-PI framework—to estimate the largest possible consumption offset by wind use.

To reach this goal, a MATLAB script was written to automate PJM load, wind, and solar generation data writing in five-minute intervals to a local PI database. A candidate location within the PJM region of Maryland was chosen for further exploration due to its topological similarity to West Virginia. Extrapolation was completed based on a nearby validated West Virginia wind facility model. The extrapolated wind potential was then utilized to note how potential generation could offset conventional electricity production.

The MATLAB-PI framework was successful in its continuous localization of PJM data. Results for the extrapolated Maryland wind model will be discussed in terms of offset for current production rates. Current limitations of this work are noted in the lack of node-specific PJM demand data, which is conversely seen in the extrapolated potential models. Future work aims to optimize wind farm parameters to sustain wind expansion based on existing technology and grid demand trends.

Funding: Summer Undergraduate Research Experience (SURE)

73. A Parametric Study of 3D Printing for Recycled HDPE and Nanoclay Composite Filaments.

Claire Fulks (Ona, WV)

Institution: Marshall University
Field: Engineering (Engineering)
Faculty Advisor: Sukjoon Na

This study aims to determine the ideal parameters needed to successfully 3D print recycled high-density polyethylene (HDPE) and nanoclay blends. HDPE is one of the most demanding polymers in engineering applications and household products due to its strong mechanical properties and chemical resistance. However, the significant use of HDPE also promotes concerns regarding accumulated plastic waste in the environment. The use of recycled HDPE may help to resolve the issue, but it is likely to possess inferior properties to its pristine counterpart. To overcome those concerns, adding nanoclay that can compensate for a loss of properties has recently gained attention. HDPE is a challenging material to use in 3D printing due to its tendency to deform and shrink during crystallization and its weak adhesion capabilities. For this study, various compositions of HDPE pellets and nanoclay powder were poured into an extruder to produce 3D filaments. The heater temperatures, rotation speed, and puller speed of the extruder used (3Devo Composer 350) were adjusted to produce the best quality filament. Double-edge-notched tensile (DENT) specimens with various ligament lengths were then 3D printed (MakerBot Method X) by using the fused deposition modeling (FDM) technique. Various print bed materials and adhesions were also tested to prevent specimen warping. Consequently, successful printing was achieved by parametric studies including build plate materials, chamber, and nozzle temperatures, printing speed, and infill pattern.

Funding: U.S. Environmental Protection Agency

74. Robotic implementation of an insect-like stereoscopic vision system

Daniel McDonald (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Nicholas Szczecinski

Animals and robots alike benefit from visual information as they navigate the world. For a robust measure of the distance to objects, they could use stereopsis, matching images across their eyes to compute the depth of objects based on their image parallax across the two eyes. However, for this they must solve the difficult problem of matching objects across images from different points of view. This is called the 'correspondence problem', and, in computer vision systems where depth perception is required, current solutions with stereoscopic cameras use algorithms similar to humans and primates to resolve this complicated problem. Smaller organisms and simple robots do not, however, have the means to process such complicated problems. Despite this, insects like mantises are highly effective in their ability to perceive the location of prey around them. Thus, we hypothesize that implementation of a mantis-based vision system into a robot will calculate approximate distances faster than contemporary vision algorithms and will be a feasible alternative. Here, we show current progress towards implementation of this algorithm.

Funding: West Virginia University

75. Techno-economic Optimization of a Palladium Membrane Reactor for Steam Methane Reforming Industrial Process

Dean Sweeney (Jefferson Township, PA)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Fernando Lima

Traditional hydrogen (H2) production via steam methane reforming (SMR) requires significant heat duty and emissions to achieve reasonable conversions and H2 yields. An alternative, yet novel, SMR technology is a palladium membrane reactor in place of the reformer and water gas shift units. Multiple studies show high thermal efficiency and product yields in a membrane reactor due to the continuous removal of H2 from the system. However, few studies analyze the membrane reactor's overall performance inside a traditional SMR process. This study integrates a counter-current palladium membrane reactor into steam methane reforming (SMR-MR) in replace of the reformer and water gas shift units. The plant is simulated in tandem with a conventional SMR plant for production rates of 100,000 Nm3/hr of 99.9% H2 product. Techno-economic optimizations are performed on the SMR-MR and conventional plants, subject to pollutants and design-related nonlinear constraints. The results indicate the increased thermal efficiency of the SMR-MR plant lowers the overall energy demand of the process. Conversely, the membrane reactor demands larger pressure gradients, resulting in increased downstream compression costs. Overall, the SMR-MR plant breaks even with the conventional plant in total annual costs (TAC) at relatively short membrane lifetimes of 1-3 years and expensive material costs, showing the competitiveness of a membrane reactor in SMR.

Funding: NSF

76. Mn-based A-Site High-Entropy Perovskite Oxides for Enhanced Solar Thermochemical Hydrogen Production

Ha Tran (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Wei Li

One of the formidable challenges is to reduce the reliance on fossil fuels and greenhouse effect. Therefore, the development of storable and transportable chemical fuels by employing the renewable energy sources is the key. Solar energy can be used to drive high temperature thermochemical processes to split water into hydrogen and oxygen in a chemical looping way. Two-step solar thermochemical hydrogen (STCH) is an ideal and promising means to produce hydrogen and oxygen from water in a decoupled way using concentrated solar radiation, avoiding the recombination and downstream H2 purification. Compared to the photovoltaic cell and photocatalysis, STCH can utilize full solar spectrum energy with great potential for high solar-to-H2 efficiency. The two-step STCH process mediated by redox non-stoichiometric oxides involves an endothermic reduction step at a high temperature (≥1200 °C) under low oxygen partial pressure with a suitable non-stoichiometric metal oxide to release oxygen and a subsequent oxidation step via flowing steam to the reduced oxide at a relatively lower temperature (~800-1100 °C). Co-based perovskites have been widely investigated for STCH, however, the expensive critical metal Co restricts its viability and cost effectiveness. Herein, Mn-based perovskites have been developed for STCH. This perovskites family is doped with lanthanoids family in A site to increase the reduction extent of Mn and STCH stability. Among various investigated compositions, (La1/6Pr1/6Gd1/6Nd1/6Ba1/6Sr1/6)MnO3 is a promising redox material, which showed a high H2 production and cycling stability under the conditions of reduction at 1350 oC and oxidative water splitting at 1100 oC.

Funding: Department of Energy

77. The Wedge Collar

Jason Constable (Beckley, WV)

Institution: West Virginia University Institute of Technology
Field: Engineering (Engineering)
Faculty Advisor: Winnie Fu

The research we have been conducting is related to increasing safety for gym-goers and saving time, space and money in relation to gym equipment. We have done research and testing on existing products and believe that we are able to produce a piece of gym equipment that will perform the functions of two existing products. One existing product is the deadlift wedge which helps a person load and unload weights onto a barbell when performing a variety of exercises in which the barbell starts on the ground. The other product is the barbell collar which securely holds weights onto the barbell. The type of collar that we have researched is a wedge type which is safer and more effective than the spring type that can be found in most gyms. Our product will take all of the useful features of these two pieces of equipment and combine them into one product for the user. The benefit of The Wedge Collar is that it will take up less space and weight in a weightlifter's gym bag, and it will be more affordable than buying deadlift wedges and barbell collars separately.

Funding: West Virginia University Institute of Technology

78. CO2 Conversion Performance of Nickel Catalysts on Varied Supports

Joseph Harrah (Evans, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Madelyn Ball

An important part of mitigating climate change is reducing atmospheric carbon dioxide (CO2) and converting it to useful products. An example of this conversion is CO2 hydrogenation, which uses heterogeneous catalysts and hydrogen to convert CO2 into valuable fuels and chemicals. Our goal is to design an effective catalyst that facilitates this reaction and investigate the role of the catalyst support on catalyst performance. We investigated how the chemical identity, surface area, and reducibility of supports influence the performance of a catalyst. First, we measured the CO2 adsorption capacity of various oxide supports using thermogravimetric analysis. Al2O3 was found to adsorb the most CO2 (130 μmol CO2/g support), followed by SiO2 (95 μmol/g), TiO2 (81 umol/g), and CeO2 (12 μmol/g). Then, we studied the performance of catalysts for the Sabatier reaction: CO2 + 4H2 □ CH4 + 2H2O. At 300 °C with a CO2:H2 ratio of 1:4, Ni/Al2O3 was the most active catalyst with a turnover frequency (TOF) of 9.1 x 10-2 s-1 and a CH4 production rate of 81 μmol/min/g catalyst. Ni/SBA-15 (mesoporous SiO2) had a TOF of 3.2 x 10-4 s-1 and a CH4 production rate of 0.0813 μmol/min/g catalyst while Ni/SiO2 (amorphous silica) had a TOF of 6.04 x 10-3 s-1 and a CH4 production rate of 0.0636 μmol/min/g catalyst. We have concluded that Ni/Al2O3 is a very active catalyst for CO2 conversion to CH4, and future work will seek to further understand the role of the support in catalytic performance.

Funding: Summer Undergraduate Research Experience

79. Compressive Strength and Heat of Hydration for Concrete Containing Ground Granulated Blast Furnace Slag

Kasey Blankenship (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Roger Chen

Mass concrete is considered by the American Concrete Institute (ACI) Committee, to be any volume of concrete in which one must take extended measures to minimize cracking due to heat from hydration. The hydration reaction between the cementitious material and water is exothermic. The heat from this chemical reaction, or heat of hydration is problematic because the concrete has low thermal conductivity, meaning the heat does not dissipate fast and the concrete will therefore have a high internal temperature. This thermal difference from the inside and outside can increase the risk of cracking. Ground Granulated Blast Furnace Slag (GGBFS), a waste material, can be used to replace a percentage of Portland cement to reduce the hydration heat and resolve this problem.

To complete this research a baseline test of 100% Portland Cement with various water to cementitious ratios (0.3 to 0.6 in increments of 0.05) were produced to measure the heat of hydration and compressive strength. An experimental mix of 50% Portland cement and 50% GGBFS with various water to cementitious ratios (w/cm) were produced to measure the heat of hydration and compressive strength. The accuracy of the measurements were tested and confirmed using the Virtual Cement and Concrete Laboratory program (VCCTL).The water to cement ratios of 0.4 and 0.45 were shown to be the most accurate when compared to the VCCTL program results. Relationships between the compressive strength and heat of hydration for mortar mixes were produced and analyzed.

Funding: Federal Work Study, WVU Research Apprenticeship Program

80. Assessment of International Bridge Codes on Modified Serviceability Requirements for I-Girder Bridges

Laura Ransom (South Charleston, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Karl Barth

This paper is focused on comparing AASHTO Standard Specification (AASHTO,2017) recommendations of the live-load deflection limit of L/800, where L is the span length, to international codes. Specifically, the implications this deflection limit has on the strength and serviceability of 65ksi wide flange beams. The deflection limit of L/800 was created with the intent of preventing human discomfort. It is also widely believed the limit serves to improve the long-term performance of concrete bridge decks. However, Wright and Walker (1971) studied the deflection limits and found insufficient evidence of the limit effectively controlling human discomfort or long-term structural damage. In addition, Fountain and Thunman (1987) suggested similar results that deflection limits do not provide any improvement in a bridge's long-term structural capability or the safety of its users. Oehler (1970) suggested that vehicle-only bridges should only have serviceability requirements that are related to stress restriction, not human comfort, as there would be no pedestrian use. The international bridge codes correspond to this suggestion and provide a serviceability limit relative to the natural frequency of the bridge rather than only the live-load deflection. Based on the anticipated pedestrian use, static deflection and natural frequencies are limited, whereas bridges with little to no pedestrian use allow a larger deflection and frequency compared to one which would have heavy pedestrian use. Preliminary results of this study show potential to increase the economic efficiency of bridge designs in the US, which may significantly impact the ability of state Departments of Transportation to improve infrastructure.

Funding: American Iron and Steel Institute

81. Modeling and Economic Optimization of Solar Power Expansion in WV using System Advisor Model

Lillian Bischof (Wheeling, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Fernando Lima

West Virginia is currently highly dependent on fossil fuels for its energy production and consumption. However, the state presents a strong capability for renewable energy systems. To continue to expand the renewable energy infrastructure in West Virginia, the feasibility of these systems must be studied. Previously, research was conducted to determine the System Advisor Model's (SAM) capabilities for modeling wind and solar energy systems [1]. By modeling renewable energy systems with SAM, feasibility of such systems can be determined with regard to performance and financial considerations. Building from this past research, this project is conceptualized to determine West Virginia's ability to meet renewable energy demand targets through solar energy modeling in SAM and financial optimization in Python. In particular, the objective of this project is to model and optimize renewable energy expansion for solar power plants in West Virginia using SAM to ultimately determine the optimal capacity for the state, while maintaining positive financial metrics such as net present value (NPV).

In this study, West Virginia's degraded land sites suitable for renewable energy expansion are studied [2]. Potential solar photovoltaic power plants in West Virginia are modeled. Relevant weather information from the National Solar Radiation Database. In particular, first SAM is used to design site specific photovoltaic layouts to maximize the capacity without considering financial factors. This serves as a benchmark for the subsequent financial constrained optimization carried out in the combined Python-SAM framework. Ultimately, this optimization aims to demonstrate the maximum feasible expansion of solar energy in the state.

82. Separation of perfluorooctanoic acid (PFOA) from drinking water sources

Maria Rincon Perez (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Oishi Sanyal

Perfluorooctanoic acid (PFOA), a perfluorinated alkylated substances (PFAS) has been identified by the US EPA as detrimental to human health. Its consumption is related to thyroid disease, and increased kidney and testicular cancer. PFAS is estimated to be present in the blood of almost all residents of the United States (USGS Report, 2022). PFOA is ubiquitous across many consumer and household items including non-stick and stain-resistant products and in fact, West Virginia waterbodies record 101-349 ng/L PFOA. This project intends to use membrane technology to remove PFOA from the water as well as microwave technology to degrade it and combine these technologies in the future to obtain a one-step separation process. The methodology followed consisted in testing 4 different types of membranes with a 10mg/L PFOA solution; PES 5K, NF 270, NF 90 and BW 30, and collect their feed, permeate and retentate in order to calculate their permeability flux and rejection towards PFOA. It was observed that the membranes PES 5K and NF 270 had the highest rejection. Simultaneously, an adsorption experiment was performed with zeolite H-ZSM-5 SAR 23 on PFOA to absorb it and then microwave it for its degradation.

83. Solar and Wind Power Station

Pau Eslava (Beckley, WV)

Institution: West Virginia University Institute of Technology
Field: Engineering (Engineering)
Faculty Advisor: Winnie Fu

The purpose of this project is to create a station that implements renewable energies such as solar and wind and store them in order to encourage our campus to start considering the idea of renewable energy in certain areas where it can be possible to eliminate electric power. Through our research we have determined that the main project problem is to find the best location for both the turbine and the solar panels in order to maximize the efficiency of both. To do so, a wind and solar evaluation must be done and then approved by the stake holders while availability and functionality are being taken into consideration. Once the both systems are installed and running a computer program will be able to display the productivity of those systems.
Finally, decide where to store all of the harvested energy so that it can be used in other projects later on. The experiment will necessitate the acquisition of skills in order to overcome obstacles and problems encountered along the way.

84. Development of Nickel Catalyst using Different Oxide Supports and Synthesis Methods

Rachel Phillips (Morgantown, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Madelyn Ball

One approach to mitigate climate change is reducing the amount of CO2 in the atmosphere via CO2 conversion into useful chemicals. To carry out this reaction, we need to understand the effects that different catalyst supports have on performance so that we can design better catalysts. In this work, we developed Ni nanoparticle catalysts using different supports and synthesis methods to investigate how these parameters influence the structure and the effectiveness of the catalyst. From this study, we will be able to more effectively utilize support materials to improve catalysts for CO2 conversion and other reactions. Catalysts were made by synthesizing nickel nanoparticles on oxide supports including silica, mesoporous silica, alumina, titania, and ceria. These catalysts were made by incipient wetness impregnation (IWI), strong electrostatic adsorption (SEA), and the direct addition of colloidal nickel nanoparticles. The catalysts were characterized by hydrogen chemisorption to measure the nickel active sites present on each support and TEM imaging was used to measure and understand how the colloidal nickel nanoparticles are adhering to the support. Through these, we found that the nickel on mesoporous silica (SEA) has largest dispersion from the studied catalyst. The colloidal nickel nanoparticles have an average size of 5 nm , and were combined with the supports to create a more active catalyst.

Funding: SURE and West Virginia University

85. An assessment of 30 years of aquatic invasive species management in the Ohio River

Abigail Clasgens (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Environmental Studies)
Faculty Advisor: Brent Murry

The Ohio River is the largest tributary of the Mississippi and has historically been degraded by aquatic invasive species (AIS). Recognition of these impacts reached a threshold in 1990 with the federal passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA), which created six regional panels and the national Aquatic Nuisance Species Task Force. The management of Ohio River AIS fell under the Mississippi River Basin Panel (MRBP), created in 1990. MRBP teamed up with the Mississippi Interstate Cooperative Resource Association (MICRA, a state lead effort formed in 1991), to develop action plans to prevent, contain, and manage AIS. Many federal and cooperative state initiatives rely on the actions of individual states, and five of the six Ohio River states created state-specific AIS plans between 1999 and 2014. We explored the USGS nonindigenous aquatic species database to compare the numbers of new AIS reaching each Ohio River state and the spread of existing species into new states with major regional and state policy milestones between 1990-2020. We found a brief across the board decrease in new invasive species introductions after the 2010 MICRA and MRBP plan, but the decline was short lived as new invasive species continued to increase after 2015. While the majority of AIS that became established were contained to 1-2 boarding states, there were many species that spread throughout all 6 states along the river (e.g. zebra mussels), leading to the clear need for increased funding to support on-the-ground monitoring and prevention between states.

Funding: United States Fish and Wildlife Service (Invasive Carps Grants)

86. An Overview of Phenology of Ichthyoplankton in the Ohio River Basin

Cooper Motzko (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Environmental Studies)
Faculty Advisor: Brent Murry

The study of ichthyoplankton is a large gap in fisheries science research. Ichthyoplankton refers to fish that are in the larval and early juvenile stage of their life cycle when their movement is dependent on currents. This is also the stage when mortality is the highest due to their susceptibility to environmental factors. The sequence of events (phenology), including their appearance and relative abundance in the Ohio River has important implications for the population dynamics of fish populations. Our study is designed to assess annual variation in the seasonality of ichthyoplankton in the Ohio River. Ichthyoplankton were collected through trawl netting using a 500-micron mesh net in four Ohio River drowned river mouths between Point Pleasant, WV and Aurora, IN (covering approximately 363 river kilometers). Samples were preserved in ethanol, then sorted to family using a dichotomous key and dissecting microscope. We found four fish families that were common across sites, including Cyprinidae (minnows), Clupeidae (shad), Percidae (perches), and Centrarchidae (bass and sunfish). Ichthyoplankton were most abundant at our most upstream sites, Point Pleasant, WV. Cyprinids and Clupeids were the dominant species across all sites. Percids were the first to appear and peak in abundance in late May; whereas Cyprinids, Clupeids, and Centrarchids peaked in mid-June. We observed similar patterns of phenology over the summer and fall sampling periods across all four sites. These observed patterns provide critical baseline data to track early life responses of fish populations to climate change and subsequent population affects.

Funding: US Fish and Wildlife Service

87. Evaluating the Recovery of Rare Earth Elements from Passive Acid Mine Drainage Treatment Systems

Eden Hodges (Glasgow, WV)

Institution: West Virginia State University
Field: Sciences (Environmental Studies)
Faculty Advisor: Amir Hass

Rare earth elements (REE) are essential for modern technology, the demand for which has been increasing over the years. Currently, the US relies on foreign countries for REE. Given its economic importance and vital role in defense technologies, it is necessary for the US to develop a domestic source for these elements. One solution may be found in passive acid mine drainage (AMD) systems – a series of ponds, originally set to neutralize the coal mine AMD pH and to precipitate dissolved metals (including REE). Because of the possibility of passive AMD sites becoming a solution, evaluating the sites and the system effectiveness at collecting REE is necessary. To do this, multiple passive AMD sites in West Virginia were monitored over a period of several months and sediment samples were collected from their different ponds. The samples were analyzed for their metal and REE compositing. Additionally, pond water chemistry was determined and its effect on sediment REE accumulation is evaluated. With the data gathered, we expect to be able to assess REE content within passive AMD systems and to retrofit them to improve their REE removal and recovery for downstream processing.

Funding: WVSU

88. Herbaceous Layer Response to Repeatedly Harvested Strip Cuts to Obtain Woody Biomass for Energy

Kelsey Razvillas (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Environmental Studies)
Faculty Advisor: Kirsten Stephan

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

Funding: WVU Davis College

89. Measuring the Present Forest to Acquire Insight of Past and Future Carbon Sequestration Capabilities

Nikki Vilasuso (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Environmental Studies)
Faculty Advisor: Brenden McNeil

All forests will inevitably experience transitions throughout their existence, whether the changes are natural cycles or human driven. These changes impact the dynamic of the forest, which will in turn alter the forested area's ability to sequester carbon dioxide from the atmosphere. Through surveying 15,340 trees located within the Summit Bechtel Reserve Mega Plot, we have created a map of the 50 acres of trees through the use of ArcGIS. This allows us to observe the differences in composition for each subplot, by comparing the diameter and species of each tree within. To monitor the mortality and growth rate of the tree species present, we have resurveyed 30 subplots that were completed in 2018, which have been compared to past data. The comparison of data reveals how well certain species are able to adapt and flourish in this forested area. We have examined the Mega Plot for spatial composition trends in order to model the forest's net primary productivity, as well as the growth and mortality rates of the 30 resurveyed subplots to aid us in determining how well certain species are able to survive, which could potentially predict the future composition of the Mega Plot.

90. Exercise and Cognitive Decline: Sedentary Behavior Predicts an Increased Risk for Dementia

Makayla Anderson (Beckley, WV)

Institution: West Virginia University
Field: Health Sciences (Exercise Science)
Faculty Advisor: Bernard Schreurs

Purpose: The population of older adults continues to rise, and is estimated to double by the year 2050. Likewise, it is expected that the number of adults with cognitive diseases will also rise. Exercise has profound effects for delaying aging of the brain and preserving memory and cognitive function (Sujkowski, 2022). This research examines if exercise plays a role in delaying cognitive decline.

Methods: This study conducted a 2-step hierarchical logistic regression to predict memory loss using data from the CDC's 2020 Behavioral Risk Factor Surveillance System. The first step predicted the effects of BMI, age, and sex on cognitive function, while the second step determined if exercise accounted for variance in memory greater than seen of BMI, age, and sex.

Results: Of the 5729 respondents who reported having cognitive decline, the average age was 54.4 years, 54.2% were female, and 76.1% of these respondents participated in exercise. The first and second test were significant $2(3, 1581) = 7.46$, $p < .001$ and $2(4, 1580) = 13.72$, $p < .001$, respectively. Of the predictors analyzed, only age and exercise uniquely contribute to the variance accounted for in memory. Additionally, those who participated in exercise were 13.8% less likely to experience cognitive decline.

Discussion: Those who live sedentary lifestyles are assumed to have an increased risk for cognitive impairment compared to those who exercise regularly. Understanding the relationship between exercise and cognitive function is important when discussing ways to prevent and delay neurodegenerative diseases.

Funding: National Institute on Aging

91. Portable Screening Solution to Firearm-related Crimes using Laser Induced Breakdown Spectroscopy (LIBS)

Leah Thomas (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Forensic Science)
Faculty Advisor: Tatiana Trejos

As gun violence increases annually in the US, the need for faster and more effective firearm-related investigations is more evident than ever. During a shooting event, the primer and propellant are released in a cloud upon discharge and this gunshot residue (GSR) is deposited on surrounding surfaces and individuals. This residue may contain elemental compositions that are characteristic of GSR. The current standard for analysis is very accurate but time-consuming and further adds to the evidentiary backlogs that crime laboratories face. In this study, we developed a modern portable analytical method for GSR analysis using Laser Induced Breakdown Spectroscopy (LIBS). The onsite real-time feedback about positive or negative calls for GSR allows law enforcement to make more informed decisions. As a result, the fast and accurate nature of this technique can speed up scene reconstructions, provide more efficient investigative leads, identify the relevant evidence, and alleviate the laboratory's backlogs. Our group has previously validated a method using the laboratory-based benchtop LIBS which has shown high sensitivity and selectivity. The development of a portable prototype allows for further investigation into the feasibility of introducing LIBS as an on-site screening tool for GSR. Limits of detection and selectivity were evaluated using GSR standards, while the accuracy was assessed through the analysis of 400 specimens: 200 from authentic shooters and 200 from the background population. Overall, the method provided responses within a few minutes with a 99% accuracy rate, demonstrating its potential for transforming the workflow for both on-site and laboratory analysis.

Funding: National Institute of Justice (NIJ)

92. Transfer and Persistence of Gunshot Residue on Clothing and Synthetic Skin Substrates by SEM-EDS

Madison Lindung (Morgantown, WV)

Institution: West Virginia University
Field: Sciences (Forensic Science)
Faculty Advisor: Tatiana Trejos

The prevalence of firearm-related incidents in the USA increases yearly, resulting in a need for more comprehensive forensic analysis and interpretation. When a gun is fired, gunshot residues (GSR) are deposited on surfaces around the discharge. Therefore, the hands and clothing of the shooter can hold valuable evidence. The gold standard method for analysis is Scanning Electron Microscope Energy Dispersive X-Ray Spectroscopy (SEM-EDS) which determines elemental and morphological characterization of inorganic GSR microparticles. This study evaluated the persistence and transfer of GSR particles over time and during post-firing activities using synthetic skin models and three types of fabrics. To study persistence, synthetic skin was tested at 0, 1, 3, and 6 hours with minimal activity, and washing. Transfer between synthetic skin included shaking and rubbing, while clothing simulated a struggle and running. Based on these analyses, the GSR on synthetic skin showed a slow loss of particles over time and near-total loss with washing. Rubbing hands had the most effect on indirect transfer compared to shaking hands. Fabric transfer was more challenging to interpret and had fewer particles recovered due to embedding of particles into the space between fibers. Running resulted in minimal loss, struggling showed less transfer between fabrics and more loss of particles, while some particles were still retained after washing. These results indicate that transfer and persistence of GSR particles depend on factors such as substrates, time since deposition, and activity type, which can aid forensic investigators in interpreting evidence.

Funding: National Institute of Justice

93. WV Forest Landowners' Perceptions of Forest Carbon Offset Programs

Jordan Stewart (New Concord, OH)

Institution: West Virginia University
Field: Social Sciences (Forestry)
Faculty Advisor: Kathryn Gazal

Several carbon offset programs have been made available to West Virginia (WV) forest landowners that allow them to manage their forests to mitigate climate change while providing an opportunity to earn extra income through carbon credits. While this market has grown rapidly, accessibility issues remain. This study aims to examine WV forest landowners' awareness and perceptions of forest carbon offset programs. The study utilized an online, structured questionnaire to survey forest landowners currently enrolled in WV's Managed Timberland Program (MTL). Preliminary results showed that 87% of respondents find it important to keep their land forested and 48% think that carbon offset programs will help keep their land forested. However, majority (58%) have no knowledge of carbon offset programs with a higher percentage (61%) not understanding the credit generation process. None of the participants are currently enrolled in a carbon offset program. Landowners perceived early withdrawal penalty, initial development cost, and legislative and price uncertainty as the top barriers to participation in these programs. Respondents were also presented with nine hypothetical carbon offset programs varying in time commitment, harvest allowance, revenue, and early withdrawal penalties. Forest landowners would most likely enroll in a program with shorter time commitments (e.g., 1-5 years), higher revenue (e.g., $30/acre/year), no early withdrawal penalty and no harvest restrictions. Results from this study can be used in evaluating existing carbon market programs and provide inputs to carbon policy initiatives to reduce barriers to landowner participation.

Funding: West Virginia University Research Office

94. Densification of Appalachian Hardwoods for Enhancing Structural Properties

Luke Chaddock (Minerva, OH)

Institution: West Virginia University
Field: Sciences (Forestry)
Faculty Advisor: Gloria Oporto

Wood densification has demonstrated effectiveness for improving physical and mechanical properties of low/medium-density lumber, and therefore upgrading its structural performance. The process of densifying wood implies the collapse of cell walls due to thermal, mechanical and/or chemical treatments. The main goal of this research is to compare different approaches of wood densification on low grade / low value hardwood species that grow commonly throughout Appalachia, and the effects these methods have on their physical and mechanical properties. Improving structural properties of wood will open opportunities for novel products that in turn will enhance economic opportunities to the sector. The species in study are yellow poplar (Liriodendron tulipifera), red oak (Quercus rubra), and soft maple (Acer saccharinum). The densification methods considered are a combination of chemo-thermo-mechanical, and thermo-hydro-mechanical processes. The properties to be measured are dimensional stability, density, bending strength, and flexure modulus of elasticity.

95. Making Place in the Mountain State: Exploring creative placemaking in Princeton, WV.

Ethan Harner (Morgantown, WV)

Institution: West Virginia University
Field: Humanities (Geography)
Faculty Advisor: Bradley Wilson

Creative Placemaking is a community and economic development strategy that leverages a community's artistic and cultural assets in order to promote development. Common creative placemaking projects include but are not limited to: public art, cultural amenities such as museums, festivals, galleries, and live music and event spaces. While there is a growing literature on creative placemaking in urban contexts, there is a gap in scholarship on rural creative placemaking, especially in Appalachia. In my research, I explore an example of creative placemaking in Princeton, West Virginia through a case study of a long-term downtown revitalization project led by the RiffRaff Arts Collective called the Grass-Roots District. I conducted 8 interviews with key informants leading the collaborative efforts. Through this case study I have explored motivations, processes of placemaking, challenges, and questions of community involvement and gentrification among lead participants. Findings affirm creative placemaking's ability to foster entrepreneurialism and local art, redevelop a community's streetscape, create a sense of collaboration among participants, and inspire hope for community members. Additionally, I found varying concepts of social justice amongst participants, illuminating the need for further research surrounding the question of gentrification.

Funding: Center for Resilient Communities, WVU SURE

96. Effects of intestinal alkaline phosphatase on neurological outcomes and gastrointestinal dysfunction in acute stroke

Abigail Tillema (Fairmont, WV)

Institution: West Virginia University
Field: Health Sciences (Immunology and Medical Microbiology)
Faculty Advisor: Candice Brown

Ischemic strokes comprise ~85% of all strokes and occur when a blood clot blocks the flow of blood to the brain. West Virginia is considered a part of the stroke belt, a region of the South Eastern United States that experiences the highest rates of strokes in the country. Current research suggests that the inflammatory response of the gut, primarily the small intestine, may play a role in the systemic disease progression of stroke. Intestinal alkaline phosphatase (IAP) is an enzyme found in the small intestine that regulates the gut by regulating inflammation. Therefore, we hypothesize that IAP regulates the interaction between the gut and the brain during stroke by decreasing stroke size, neurological complications, intestinal permeability, bacterial burden, and it regulates motility. We accomplished this by inducing photothrombotic strokes (PTS) in male and female mice with a deletion of the gene that encodes for IAP, Akp3, and their wild-type littermate controls. At 24 hours post-stroke, neurological and gastrointestinal impacts were evaluated. Results demonstrated that our stroke model was effective at inducing stroke, however no neurological differences were observed between groups at 24 hours. Gastrointestinal outcomes showed an increase in permeability in mice without Akp3, as well as an increase in bacterial load in the illeum. Overall, this study will improve our understanding of how intestinal alkaline phosphatase influences clinical outcomes in stroke patients.

Funding: National Institute of Health

97. Effects of Novel Compound (ELP-004) on Multiple Myeloma Cell Proliferation and Associated Bone Degradation

Emma Swiger (Morgantown, WV)

Institution: West Virginia University
Field: Health Sciences (Immunology and Medical Microbiology)
Faculty Advisor: John Barnett

Multiple myeloma (MM) cells cause bone erosion by secreting factors that activate osteoclasts, cells responsible for bone degradation. Our lab has shown that a novel small molecule (ELP-004) reduces osteoclast proliferation and prevents bone loss in mouse models of arthritis. We hypothesize that ELP-004 inhibits proliferation in MM cell lines and reduces bone loss in MM mouse models. Here, MM cells were treated with ELP-004 to assess cell proliferation and apoptosis. In human (MM.1S and U266) and mouse (MOPC-315) cell lines, ELP-004 inhibited proliferation and increased apoptosis in a concentration-dependent manner. When used in combination with bortezomib, a drug used to treat MM, ELP-004 increased cell death compared to bortezomib alone in human cell lines. To test whether ELP-004 reduces MM-associated bone erosion, U266 cells were engrafted into NOG mice and ELP-004 was administered for approximately 6 weeks. Micro-CT analyses of bone samples show some positive trends in the reduction of bone erosion by ELP-004. A study utilizing the engraftment of U266 cells into immunocompromised NSG mice as a model of MM is ongoing. These data suggest that ELP-004 may be a promising drug to treat bone degradation in MM, increasing patients' quality of life and decreasing the burden of symptoms.

Funding: This research was supported by the Department of Microbiology, Immunology, and Cell Biology's Immunology and Medical Microbiology Internship and ExesaLibero Pharma, Inc. Further funding was provided by STTR grant R42 AR074812 and WV state-matched funds.

98. Anti-inflammatory and Anti-microbial Activity of Recombinant Alkaline Phosphatase in a Mouse Model of Sepsis

Kennedi Lewellyn (Buckhannon, WV)

Institution: West Virginia University
Field: Health Sciences (Immunology and Medical Microbiology)
Faculty Advisor: Candice Brown

Sepsis is a severe systemic immune response to an infection in the body. This response results in multi-organ failure which contributes to a high mortality among sepsis patients. Approximately 75% of sepsis deaths are in individuals older than 65. This is a significant public health issue in West Virginia's aging population. Currently, there are no FDA-approved therapeutics to treat sepsis other than supportive therapies. Alkaline phosphatase (AP) is an enzyme that is present throughout the body and is known to have anti-inflammatory properties. Therefore, this enzyme has been proposed as a potential therapeutic treatment for sepsis. Recombinant alkaline phosphatase (recAP, AM-Pharma) is a drug currently in Phase III clinical trials and reduces mortality by 40% in sepsis-associated acute kidney injury (SA-AKI). recAP is a highly stable and highly active enzyme. The goal of this study was to test the efficacy of recAP on survival, bacterial load, and inflammation in a cecal ligation and puncture (CLP) model of sepsis. CLP was induced in mice followed by daily injections of recAP (1.6mg/kg) for four days. The modified murine sepsis score (MMSS) was used to assess morbidity and sepsis severity. Mice were euthanized seven days post CLP to evaluate bacterial load and inflammatory markers. Results demonstrate that recAP may aid in bacterial clearance and decrease intestinal inflammation. Decreased mortality and lower MMSS scores were also observed in recAP-treated mice. These findings support the use of recAP as a therapeutic agent to treat sepsis infections that originate in other organs beyond the kidney.

Funding: NIH R21 AG070443 and T32 AG052375

99. Applications in Kalman Filtering on Stochastic Time Scales

Davis Funk (Martinsburg, WV)

Institution: West Virginia University
Field: Sciences (Mathematics)
Faculty Advisor: Nicholas Wintz

The Kalman filter is a prediction-correction tool widely used in navigation, ballistics, and signal processing. The filter can be implemented for both discrete and continuous time, where the continuous version is derived from the discrete. The continuous filter is generally not practical for digital implementation. In this project, we consider continuous models that when linearized, any nonlinear term becomes absorbed by the noise. Traditionally, these models are further discretized for simulation using a fixed time step. Such models include radar detection of an aircraft in mid-flight, the susceptible, infected, recovered (SIR) model, and Lotka-Volterra predator-prey dynamics among others. Instead, we use a random variable, symbolized by the greek letter mu, which represents a non-constant gap between sampling points. This results in a Kalman Filter on a stochastic time scale. This process of linearization and discretization was begun by Poulsen and Wintz, and was continued by the group. Simulations were implemented using the Python programming language.

Funding: National Science Foundation (NSF)

100. Craniosynostosis in the Appalachian Region

Anushka Pathak (Morgantown, WV)

Institution: West Virginia University
Field: Health Sciences (Medical Research)
Faculty Advisor: Pavithra Ellison

Background: Craniosynostosis affects between 1 in 2,000- 2,500 births per year and predisposes children to neurodevelopmental delays and increased intracranial pressure. Many of these children require surgery to correct these defects. In addition to the complexity of these surgeries, healthcare in the Appalachian region is inaccessible for many residents due to geographic issues, poverty, and lower degrees of social support. To address these challenges, a multi-disciplinary approach and protocols have been developed to ensure each patient receives the same level of care.

Methods: An institutional review was done in the WVU hospital system during the perioperative period in patients undergoing craniosynostosis surgery. Members of the multi-disciplinary team were interviewed which included plastic surgery, neurosurgery, anesthesiology, PICU, pediatric neurology/neurodevelopment, and pediatric behavioral medicine/psychiatry.

Results: Erythropoietin is started 6 weeks prior to surgery to reduce the rate of blood transfusions with a pre-operative hemoglobin goal of 13. After surgery, patients are admitted to the pediatric intensive care unit and started on a dexmedetomidine infusion. WVU has initiated a lab schedule to reduce the amount of blood draws which consists of CBC on arrival to the PICU, at 8 pm, and 5 am post-operative day 1.

Conclusions/Discussion: Initiation of these protocols allow for patients at WVU to experience an equalized level of care throughout perioperative period. Outcomes in our institution are comparable to the top 5 institutions participating in the registry which includes USA, Canada, South Africa and Australia for blood management, length of stay, blood donor exposure and medications used.

101. The Effects of Adolescent Binge Ethanol exposure on astrocyte maturation and synaptic colocalization

Dylan Prasad (Charleston, WV)

Institution: University of Charleston
Field: Sciences (Neuroscience)
Faculty Advisor: Louise Risher

Binge drinking is highly prevalent among adolescents and early 20's. Recent studies demonstrate that adolescent females are now consuming similar amounts of alcohol as their male counterparts. Progress has been made in understanding the consequences of binge drinking on neuronal function, however little is known about the role of astrocytes particularly in female models of drinking. Since astrocytes ensheath synapses and are critical for appropriate synaptic function we investigated the effects of adolescent intermittent ethanol (AIE) exposure on astrocyte-synaptic colocalization in female rats. Female Sprague Dawley rats received an intracranial injection of an astrocyte-specific adeno-associated virus into the dorsal hippocampus (dHIPP). Beginning on PND30, animals received AIE or water for 16 days. Brains were collected 24 hours after the 10th dose or after a 26-day washout. Immunohistochemistry was performed on dHIPP brain slices to assess astrocyte-synaptic colocalization and astrocyte density. Results show an AIE-induced increase in astrocyte-synaptic colocalization following the 26-day washout that was not driven by changes in astrocyte number. Data from 24hrs after the 10th dose will also be presented. These data demonstrate that AIE results in a decrease in astrocyte-synaptic interactions in females that persists into adulthood. How disruption of these processes contribute to the long-term EtOH induced synaptic changes and cognitive changes previously observed is yet to be determined. (Supported by NIH Grant P20GM103434 to the West Virginia IDeA Network for Biomedical Research Excellence)

Funding: INBRE

102. Can we use immune cells to heal nerve cells?

Emily Herron (Weston, WV)

Institution: West Virginia University
Field: Health Sciences (Neuroscience)
Faculty Advisor: Aminata Coulibaly

Immune cells are the body's line of defense against infection and play a critical role in healing after injury. One important cell in the immune system is the neutrophil; it is the most numerous immune cell and the first to be recruited to a site of infection or injury. In the case of injury to the brain or disease of the nervous system, neutrophils infiltrate the brain and its surrounding areas. All cells in the body need an energy source. We know that neurons use lactate to produce energy for their activity. During injury, especially in stroke, there is an energy failure in the brain because of lack of blood flow, and therefore, oxygen and nutrients. It is well known that neutrophils release lactate into their surroundings while activated. As such, our lab asks whether neutrophils can be manipulated to provide energy for neurons after stroke, since they are in the brain after the injury. To test this, we grew brain cells in a petri dish, then exposed them to neutrophils activated by different stimulation conditions (with bacteria or a viral mimic). We tested the amount of lactate produced by the neutrophils in these conditions and its effect on the brain cells. Our results show that neutrophils release lactate under stimulation by these conditions and that neurons exposed to these stimulated neutrophils increase their energy production. This interaction tells us more about the state of brain cells in injury or disease where neutrophils infiltrate the brain in abundance.

Funding: National Institute of Neurological Disorders and Stroke

103. Repeated Throwing decreases the Stability of the Medial Elbow of Novice Throwers.

Brettina Jeffers (Huntington, WV)

Institution: Marshall University
Field: Health Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Mark Timmons

Introduction: The literature shows that the elbows of experienced overhead-throwing athletes undergo morphological changes, due to the stresses placed on the anatomy of the elbow. The effect of an acute bout of throwing exercise on the elbow anatomy of novice throwers is not known. The purpose of the current study was to explore the effects of throwing on the medial elbow joint space (MEJS) width, and the strength of the muscles that stabilize the medial elbow of novice throwers.

Methods: Eight novice right-handed throwers without upper extremity injury history participated. The participants' grip strength was measured. Ultrasound images of the participants' medial elbows were collected during an elbow valgus stress (VS) test. Participants then performed a session of 60 overhead throws. The grip strength and ultrasound testing were repeated following the throwing session.

Results: Grip strength decreased following the throwing on both sides (right=1.4±2.1Kg, $P=0.089$; left=0.4±2.5Kg, $P=0.694$). But neither decrease reached statistical significance. The MEJS was not different between the left and right sides ($P=0.408$). The MEJS increased during the VS on both sides (0.823±0.04mm, $P<0.001$). After the throwing bout, the MEJS increase was greater ($P=0.008$) on the right (1.05±0.12mm) compared to the left side (0.54±0.94mm).

Conclusion: This single bout of throwing produced changes in the elbow anatomy in novice throwers that are consistent with anatomical changes reported in experienced throwers. Future work needs to determine how long the findings of the current study last. This information will help establish throwing repetition limits for young throwing athletes.

104. Medial Knee Joint Width Differs Between the Valgus Stress and Anterior Medial Rotation Tests

Dustin Darnell (Huntington, WV)

Institution: Marshall University
Field: Health Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Mark Timmons

Context: The medial collateral ligament (MCL) provides knee stability in the frontal plane. The deep fibers of the MCL (dMCL) have been shown to provide transverse plane stability. The anterior medial rotation (ANTMED) stress test is used to determine the frontal and transverse plane knee stability. The purpose of this investigation was to determine the difference in the knee joint space width under valgus stress (VS) compared to the ANTMED rotation test.

Methods: The medial joint space width was measured on ultrasound images of the medial knee taken during the ANTMED test and VS test. The change in the width during the VS test and the ANTMED was compared. Paired t-tests were used to detect differences between the unstressed and stressed conditions and the difference between the tests.

Results: The width of knee joint space increased under both tests. The joint space increase was less during the ANTMED rotation (right knee=2.77mm, $P<0.001$, left knee = 3.52mm) as opposed to pure VS (right knee=3.83mm, $P<0.001$, left knee=4.24mm, $P<0.001$). The change in the medial joint space during the ANTMED test was greater during the VS test (right knee=1.07mm, $P<0.001$, left knee=1.23mm, $P<0.001$).

Conclusion: There was a statistical difference in the medial joint space of both knees between the valgus test and the ANTMED rotation test. The observed differences in the width of the joint space were greater than the minimal detectible change (MDC = 0.794mm). The results suggest that the ANTMED knee rotation test could detect injury to the dMCL.

105. Tibial Rotation Can be Measured Reliably Using a Digital Inclinometer and Electromagnetic Tracking.

Hunter Copley (Huntington, WV)

Institution: Marshall University
Field: Health Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Mark Timmons

Introduction
An inexpensive, and reliable method to assess tibial internal (IR) and external (ER) rotation will improve the assessment of knee injuries. The purpose of the current study was to explore the reliability and measurement error of two methods to measure tibial IR and ER.

Methods
Eight subjects free from knee injury participated. Tibial IR and ER of both legs were measured using electromagnetic tracking (ET) and a digital inclinometer (DI). The ET sensors were placed on the thigh and the shank segments. The DI was held in place by a custom-made bracket placed immediately proximal to the shank sensor. Maximum tibial IR and ER were measured in three trials. The intraclass correlation coefficient (ICC) was calculated across trials for both techniques. The standard error of the measure (SEM) and minimal detectable change (MDC) were calculated.

Results
The ICC values ranged from 0.914-0.834 on the right side. The left-side ICC values ranged from 0.894-0.187. Strong ICC values were found for both IR and ER and both measurement techniques. On the left side, we saw strong correlations for IR with the DI, but poor correlations for ET. Both techniques produced poor correlation for left-side ER. The SEM ranged from 1.6°- 0.68°; MDC ranged 2.2°- 0.97°.

Discussion
The results of the current study show that both right-side tibial IR and ER can be measured reliably and accurately measured with both measurement techniques. The poor ICC values seen on the left side suggest that more work is needed to improve the measurement reliability.

106. Perceived Risk of Adventure Sports Among West Virginia Residents

Miles Bowlin (Morgantown, WV)

Institution: West Virginia University Institute of Technology
Field: Social Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Joshua Roe

Tourism is an increasingly crucial sector of West Virginia's economy, and the state's abundant natural resources suggest potential for tremendous financial gain from increased participation in adventure sports. However, public interest in adventure sports remains limited to relatively niche communities within the state. Through the analysis of a self-administered survey, this study will explore perceived risk as one potential barrier to increased participation in adventure sports among West Virginia residents. In particular, this study will examine potential relationships between perceived risk of adventure sports and attributes such as an Appalachian cultural identity, gender identity, and household income as they vary among its participants. Thus, the results of this study will establish a baseline understanding of the perceived risk of adventure sports among West Virginia residents for future comparison to other possible deterrents to participation. Upon determining what dissuades West Virginia residents from engaging in adventure sports, West Virginia legislators and adventure recreation professionals alike may more effectively develop strategies to integrate adventure sports into local lifestyles and garner support for growth within the adventure tourism industry.

107. A Bout of Throwing decreases Shoulder Strength and Subacromial Space Width in Inexperienced Throwers.

Rileigh Elk (Huntington, WV)

Institution: Marshall University
Field: Health Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Mark Timmons

Background: Athletes participating in overhead-throwing sports commonly report shoulder pain and injury. These injuries are frequently attributed to muscle fatigue from repeated throwing. Differences in shoulder strength and supraspinatus thickness are reported in experienced throwers but the effects of throwing on inexperienced throwers are unknown. The study tested the hypothesis that following a bout of throwing, participants would show decreased shoulder strength, subacromial space width, and increased supraspinatus tendon thickness.

Methods: With written informed consent, nine right-handed non-experienced throwers without a history of shoulder injury participated in the investigation. The participants' shoulder strength and range of motion were measured using standard clinical procedures. Ultrasound images of the participants' supraspinatus tendon and subacromial space were collected. Measures of supraspinatus tendon thickness and subacromial space width were made on the images. Then participants performed 60 overhead throws of a softball. All measurements of strength, range of motion, and ultrasound imaging were repeated following the throwing bout.

Results: After the throwing bout, strength decreased for external rotation (difference=0.7Kg, $p=0.026$) and middle trapezius (difference= 1.1Kg, $p=0.002$). The subacromial space width decreased at 45° arm elevation (difference=0.55mm, $p= 0.051$). No differences in supraspinatus tendon thickness were found after the throwing bout.

Conclusion: The study identified decreases in shoulder strength and subacromial space width consistent with the development of rotator cuff disease. The results of the current study suggest that intervention to reduce the muscle fatigue associated with repeated throwing, specifically middle trapezius muscle strength, might help reduce the risk of developing shoulder injury in throwers.

108. Effects of Physical Activity on Tumor Induced Muscle Fatigue in PyMT Mice

Tyler Giorcelli (Fairmont, WV)

Institution: West Virginia University
Field: Sciences (Physical Activity and Sport Sciences)
Faculty Advisor: Emidio Pistilli

Introduction: The objective of this study is to explore the relationship between muscle fatigue and tumor growth. To study this relationship, tumors related to breast cancer were observed to determine if physical activity had a positive influence on exercise capacity at different stages. Methodology: PyMT mice aged 4, 8, and 12 weeks old were selected. Each experimental group was paired with control mice. The experimental groups of mice were all at different stages of tumor growth. Each group was trained on a treadmill for 4 weeks with performance tests at pre-training and post-training to quantify the effects of training. Results: In stage 1 post-training, there was an increase in maximum time to exhaustion, distance, and speed for the control group (23.29578%, 49.22234%, 22.41667% respectively) and PyMT mice group (25.16497%, 31.92723%, 20.65844% respectively). In stage 2, there was still improvement in control (16.85167634%, 48.77234963%, and 19.61296613% respectively) and PyMT mice (40.73486144%, 62.40533122%, and 27.41968882% respectively). In the later stages, some mice couldn't complete the 4-week training due to severity of tumor growth. The stage 3 PyMT group on average showed a decrease in maximum speed, time to exhaustion, and distance at -45.0564687%, -68.12023816%, and -45.87149349 respectively, while the control mice still showed large improvement (22.94689652%, 47.55415091%, and 37.04733648% respectively) . Conclusion: In the earlier stages, there seems a positive effect of exercise on the mobility of the PyMT mice, but as the stages progressed, there was no benefit in tumor bearing mice while the control mice still improved.

Funding: NASA WV Space Grant Consortium

109. Functionalization of Polycarbonate Membranes with Anionic Azo Dyes

Alan Messinger (Huntington, WV)

Institution: Marshall University
Field: Sciences (Physics)
Faculty Advisor: Sean McBride

Annually, nearly 300,000 of the 7 × 105 metric tons of synthetic textile dyes produced, such as those used in fabric dying for clothing, are discharged into the environment causing devastating effects to the surrounding ecosystem. While this mainly occurs overseas, the possibility of water sources being contaminated due to polluted sources overseas could occur in the future. Recent research shows that polycarbonate filters functionalized with anionic azo dyes, have the potential to enhance charged based rejection and obtain purified water during the filtration process as a result. This azo-dye-functionalization provides an elegant solution to water pollution by textile dyes, demonstrating that the textile dyes, thus the contaminants, are part of the solution to the problem. Specifically, this work aims to decipher if properties such as chemical structure of the azo dyes contribute to varying functionalization rates. An Azo dye series with an intrinsic charge of negative two at 1000μM shows there is a large variance in functionalization rate based on dye structure and functional end groups. Direct red 28, direct red 2, direct brown 2 and direct red 37 have been shown to have the highest potential as functionalizing dyes with the largest rate of functionalization. These dyes will be used in future research to try and help determine what parameter is responsible for the functionalization process. Overall, this research paves the way for the overall goal of water purification of textile dyes and other charged contaminants.

Funding: Marshall University

110. Cardiac-specific Knockout of Na, K-ATPase α1 Blunts Cardiac Hypertrophy in the Mouse

Layne Assif (Hurricane, WV)

Institution: Marshall University
Field: Other (Physiology)
Faculty Advisor: Sandrine Pierre

In the United States, it is estimated that 6.2 million adults have heart failure. This chronic disease causes the heart to be unable to pump blood properly. It is often a result of pathological hypertrophy, which is characterized by the thickening of the heart muscle and an increase in cell size. There is pharmacological experimental evidence that the α1 isoform of Na/K-ATPase (NKA) is critical for cardiomyocyte hypertrophy, but definitive genetic evidence is lacking. To achieve this goal, we generated mice with a cardiac-specific knockout of the NKA α1 isoform (cardio α1-/-) and compared them to their control littermates (cardio α1+/+) exposed to hypertrophic stimuli in vivo. Echocardiograms were performed to check for any abnormalities between cardio α1+/+ and cardio α1-/- mice at baseline. The left ventricle was traced in m-mode parasternal short-axis to derive the parameters. Results showed that cardio α1-/- mice have no overt cardiac structural abnormalities at baseline as assessed by heart weight/tibia length ratio to check for cardiac hypertrophy In addition, cardio α1-/- mice showed preserved systolic function as assessed by several echocardiographic parameters. To stimulate cardiac hypertrophy, we treated cardio α1-/- mice with angiotensin-II via osmotic minipump (1.5 mg.kg-1.day-1 for 1 week, n=6-15 male mice 8-12 week-old). Results demonstrated that cardio α1+/+ mice developed cardiac hypertrophy, whereas cardio α1-/- mice did not develop cardiac hypertrophy, based on heart weight/tibia length ratio ($p<0.05$). This data suggests that the NKA α1 isoform is important to drive cardiac hypertrophy.

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111. Political Ideology Bias Regarding Political Actors

Amara Mason (Fairmont, WV)

Institution: University of Charleston
Field: Social Sciences (Political Science)
Faculty Advisor: Brad Deel

Polarization within the political parties in America has been steadily increasing. This is an issue for all Americans and its governmental systems. It is utterly disadvantageous in a democratic society to polarize, inconsiderate of true policy. At this point, it is unclear whether voters are voting based on policy or simply voting along with their claimed political party. This study is specifically aimed at targeting the polarization issue regarding voting habits. It will test participants' unconscious decision making when to comes to agreement with political actors. Many people may agree with declarations from a political actor solely because the political actor represent the same party as themselves, without properly analyzing the content which was said. This study will present a series of fabricated quotes to participants. Each quote will be labeled with a mock political actor and paired with a party affiliation. Accordingly, each quote will be randomized in political content. This randomization includes statements that are conservative or liberal in nature. E.g., a quote labeled with a liberal political actor may be conservative in nature. Participants will then be asked to rate each statement to determine the degree of agreeableness with each statement. It is hypothesized that within the findings of this study, data will conclude, participants will agree more with quotes that are labeled with actors of their own political affiliation, even if the content is opposite of typical ideologies of their party affiliation.

112. Rehabilitating Modern German Political Thought in the Post-WWII Era

Caleb Roark (Beckley, WV)

Institution: West Virginia University
Field: Humanities (Political Science)
Faculty Advisor: Philip Michelbach

Since the fall of Nazism in 1945, many political theorists have implicated modern German political thought with the succession of the Third Reich. However, important German political theorists such as Martin Luther, Samuel Pufendorf, and G.W.F. Hegel, devote modern ideals and philosophies within their work to their readers that can also be seen today within America, which I will argue for within my research paper. Before beginning a detailed dive of each philosopher, the paper sketches out political theory by detailing the three separate viewpoints that dominate the field: the Straussians, the Cambridge School, and the political theorists. After this sketch, the paper rationalizes protestant reformer Martin Luther's rebuking of the church, and how his ideas of equality among the vocations, the necessity of literacy to read and interpret the Bible, and his doctrine of the separation of the two realms helped shape modern ideals of equality, individual responsibility, and separation of church and state through his interpretation of the Bible. Following this, the paper discerns Pufendorf's and Hegel's Lutheran influences within each political theorists' work and examine how each utilizes Luther's influence to make their own positive additions to democratic theory, thus rebuking their implication in supporting totalitarianism.

Funding: WVU SURE

113. A Discussion of West Virginia Housing Policies and Consequences on Racial Segregation

Kimberly Keefer (Charleston, WV)

Institution: University of Charleston
Field: Social Sciences (Political Science)
Faculty Advisor: Hallie Chillag

Many people are familiar with racial discrimination and the effects in the shaping of the United States. Fewer people are familiar with how racism present in historical housing policies have affected the shaping of our neighborhoods. This research examines the correlation of housing policies and racial division in West Virginia. At the forefront of today's news, we see a divide with movements motivated by police brutality, racially charged incidents, hate crimes, and a lengthy catalog of other racist tallies. With closer inspection, we unravel a veil of systems of inequality that have been hidden within plain sight in our past policies and ordinances. This research makes a methodological connection between historical and geographical data while simultaneously differentiating from accepted societal behavior and norms consistent with the time period of discussion. This methodology will determine if a causal relationship exists and enable us to become more aware as a society of how to identify such language in policies and implement plans to reverse the consequences of these variables. This in turn will help us create a plan for a new causal relationship that will reap more explicit diversity and inclusion reversing the aftermath of the previous polices. This research provides a safe and relevant area of discussion that helps us acknowledge our past and move forward with more informed and inclusive focus on housing.

114. Religion and Hyper-partisanship in US Politics: The Case of West Virginia

Timothy Wise (South Charleston, WV)

Institution: University of Charleston
Field: Social Sciences (Political Science)
Faculty Advisor: Kara Fisher

Religion has played a role in political processes since the conception of the United States as a nation, when the founders utilized their deeply religious beliefs to construct the form and functions of government that still exist today. Over time, religion has become increasingly influential in the political landscape. Particularly many contemporary debates stem from policy preferences and choices tied to religious belief. Some argue that religious preference has become the catalyst for the political polarization of recent decades. This research examines the current literature and data collected through the National Election Study to consider the developments in partisanship for the current landscape and with a particular lens for the case of West Virginia. Much of the literature focuses on religion in the post 9/11 context as an indicator of conservatism or liberalism, but not the rising gap in the middle or hyper partisanship and polarization that appears to be developing. This study will attempt to further illuminate the role of religiosity and hyper-partisanship, particularly in West Virginia.

115. What types of emotion regulation can be protective for Gender and Sexual Minority Youth?

Alyssa Carpenter (Bridgeville, PA)

Institution: West Virginia University
Field: Humanities (Psychology)
Faculty Advisor: Amy Gentzler

LGBTQ+ youth are more likely to struggle with depression and anxiety (Durrbaum & Sattler, 2020). Emotion regulation (ER) is "processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" and has been found to be associated with almost all psychological disorders (Gross, 1998). In a sample of 14–16-year-old adolescents mainly from West Virginia, the present study examines anxiety in LGBTQ+ in comparison with cishetero youth, and how ER processes affect levels of anxiety. I hypothesized that sexual and gender minority youth will report higher anxiety levels and less effective ER (e.g., more rumination, suppression) strategies, but that effective ER (e.g., reappraisal, support-seeking, distraction) can help youth feel less anxiety. The current study results showed that minoritized youth (N=23) reported higher levels of anxiety compared to cishetero youth (N=263). LGBTQ+ youth also reported using less reappraisal, but higher distraction and rumination levels compared to their cishetero counterparts. When testing if any ER strategies could offset one's risk for anxiety, one result showed promise. Teens' support-seeking moderated the group difference in anxiety such that LGBTQ+ teens only reported elevated anxiety symptoms if they use low or average support seeking but not high support seeking. Thus, support-seeking appeared to be a protective factor for LGBTQ+ youth. This research offers insight into minority mental health and provides possible strategies that social institutions or clinicians can foster to combat the struggles LGBTQ+ youth face in their lives.

Funding: National Institutes of Health

116. Cool and Warm Colors on Background and Ink Affecting Memory Recall

Emelina Alvarez (Charleston, WV)

Institution: University of Charleston
Field: Social Sciences (Psychology)
Faculty Advisor: Michael Bayly

Memory is considered one of the core cognitive processes. It is referred to as the mental process of encoding, storing, and retrieving information from the environment (Dzulkifli & Mustafar, 2013). One of the most challenging questions when it comes to memory is how to improve its performance. Color functions as a strong information channel and has an important role in memory performance (Dzulkifli & Mustafar, 2013). This study intends to observe the effect that cool and warm colors have on memory recall. This will be done by measuring memory recall on nonsense three-letter syllables using approximately 80 to 90 students ranging in age from 18 to 21. Participants will be shown 20 slides each containing a nonsense syllable for five seconds each. Manipulated in the study is the color of the ink (blue, red, or black) and the background color of the screen (green, orange, or white), producing a 3 by 3 independent groups factorial design. Following the nonsense syllable list, participants will be exposed to a three-minute maze task and then they will be measured for their recall of the words. It is anticipated that better performances on memory recall will be achieved with warm and cool colors than neutral colors.

117. Want to Start Smoking? Think Again!

Ethan Boddy (Charleston, WV)

Institution: West Virginia University
Field: Social Sciences (Psychology)
Faculty Advisor: Julie Patrick

Background/Purpose: Findings suggest smoking adversely affected the structural integrity of subcortical brain regions with increasing age and exposure (Durazzo et al., 2017). Healthy aging, including minimizing exposure to smoking can be regulated throughout a lifetime.

Methods: Using data from 5706 West Virginian adults who completed the 2020 Behavioral Risk Factor Surveillance System (BRFSS) survey through the Center for Disease Control (CDC), we examined whether the relations among age and decision-making difficulty varied as a function of smoker status by conducting a moderated regression analysis. Age, smoker status and the interaction predicted decision difficulty, Chi square (DF=4) = 134.12, $p < .001$.

Results: The results of the equations showed that younger adults ($b = -.53$) reported more difficulty with decision making and that current smokers ($b = -.16$) reported more difficulty with decision making, However, the interaction between age and smoker status was also significant ($b = .15$), showing that younger smokers reported the most difficulty with decisions.

Conclusions: Smoking has been confirmed as detrimental to the well being of West Virginian adults of all ages, but the negative cognitive effects are more severe among younger adults.

Funding: WVU AGE-ADAR

118. Caregiving demands and income predict depression among caregivers to those with developmental disabilities

Grace Udah (Westover, WV)

Institution: West Virginia University
Field: Social Sciences (Psychology)
Faculty Advisor: Grace Udah

Background: Caring for a relative with intellectual and developmental disabilities (IDD) results in a greater risk of depression and anxiety, due to several stressors, including caregiving demands and financial strain (Scherer et al., 2019).

Methods: Using data from the 2020 Behavioral Risk Factor Surveillance System (BRFSS) from the Centers for Disease Control and Prevention (CDC), we conducted a hierarchical logistic regression predicting depression. Approximately 31.16% of the 166 caregivers reported having depression.

Results: Step 1 included the caregiver's age, the number of hours of care per week, and how many personal-care tasks the caregiver performed for the person with IDD. Step 2 added income to the equation. The model was significant X^2 (Df = 4, N = 166) = 18.24, $p<.002$, but only income uniquely contributed to the equation. Caregivers providing more care reported 1.38 times more depression than those providing fewer hours; caregivers who helped with personal care tasks reported 1.56 times more depression than those who didn't.

Conclusion: Caregiving burden and depression vary depending on the characteristics of the individual with a disability and their caregivers. Services for decreasing caregiving burdens may be optimized by focusing on these characteristics (Nam and Park, 2016). Based on the relationship between income, caregiving hours, and depression, it is essential that we help identify what needs caregivers lack, such as health care services or mental health support.

Funding: National Institute of health

119. COVID-19, Time Perspective, and Coping Strategies Related to College Students' Mental

Isabella Crouch (Hurricane, WV)

Institution: West Virginia University
Field: Social Sciences (Psychology)
Faculty Advisor: Jonell Strough

Research conducted during the COVID-19 pandemic found that college students had anxiety about health and well-being (Kibbey et al., 2021), a negative outlook on time perspective (Nowakowska, 2020), and depression (Lopes & Nihei, 2021). Students coped with this by engaging in activities like exercising and staying social with work, school, peers, and family (Huang et al., 2022). Here, we investigated whether college students' coping behaviors, perceptions of COVID-19, and time perspective were related to mental health. US public university students (N=269) reported anxiety and depression using a standard scale ("little interest or pleasure in doing things," Kroenke et al., 2009); future time perspective ("Many opportunities await me in the future," Strough et al., 2016); COVID-19 perceptions ("On a scale from 0-10, how worried are you about coronavirus?"); and coping behaviors ("How many days in the past week have you connected socially with friends or family?"). Greater coping via relaxation, meditation and exercise were associated with less anxiety, whereas greater coping by using substances and greater worry about COVID-19 were associated with more anxiety, $R2 = .11$, $F(7, 261) = 5.85$, $p < .001$. Greater coping via maintaining social connections and via relaxation, meditation and exercise, as well as greater orientation toward future opportunities, were associated with less depression, whereas greater coping by using substances and greater worry about COVID-19 was associated with more depression, $R2 = .18$, $F(7, 261) = 9.52$, $p < .001$. Findings demonstrate that further intervention is needed to improve college students' depression and anxiety.

120. PROPYLENE GLYCOL AND VEGETABLE GLYCERIN INHALATION EXPOSURE INCREASES CIRCULATING XANTHINE OXIDASE IN PREGNANT DAMS

Kallie Schafner (Morgantown, WV)

Institution: West Virginia University
Field: Health Sciences (Toxicology, Physiology & Pharmacology)
Faculty Advisor: Elizabeth Bowdridge

West Virginia has the sixth highest prevalence of electronic cigarette (e-cig) use in the country. An excess of circulating free radicals, highly reactive unstable molecules, from e-cig use may cause tissue and organ damage especially during gestation when the fetus is developing. Therefore, we examined the effects of propylene glycol and vegetable glycerin (PG/VG), the main liquid components in e-cigs, inhalation on maternal and fetal outcomes. Pregnant Sprague-Dawley rats were randomly assigned to sham-control or a PG/VG 50:50 ratio. Whole body e-cig inhalation exposures were performed (90 min/exposure; 30 W atomizer; 6d) during gestational days 10-19, with the last exposure occurring 24 hours prior to sacrifice. Mean exposure chamber aerosol concentration was 569 ± 56 mg/mL with particle size ranging between 100 nm (ultrafine) and 1 nm (fine). Plasma xanthine oxidoreductase activity was elevated 3-fold in PG/VG dams compared to sham-control ($p<0.05$). Additionally, placental xanthine oxidase activity was increased in the PG/VG group (6.50±0.51 mU/mg) versus sham-control (3.65±0.42 mU/mg; $p<0.05$). Pup and placental mass were reduced in the PG/VG group (2.1±1.1 g; 0.6±0.2 g) compared to sham-control (3.3±0.7g; 0.7±0.1 g; $p<0.05$). Placental efficiency (grams of pup/gram of placenta) was also reduced in PG/VG dams (3.7) compared to sham-control (4.4; $p<0.05$). In maternal plasma, prolactin levels were decreased in sham-control (2.31±0.05 ng/mL; $p<0.05$) versus PG/VG. PG/VG inhalation exposure during pregnancy may have adverse effects driven by free radicals on maternal and fetoplacental tissues.

Funding: NIH & WV CTSI

121. Design, Synthesis, and 3D-Biofabrication of Bone Tissue Scaffolds for the Treatment of Bone Pathology

Kaitlyn Legg (Charleston, West Virginia)

Institution: Marshall University
Field: Engineering (Biomedical)
Faculty Advisor: Roozbeh (Ross) Salary

Many patients suffer yearly from bone fractures and defects worldwide. Projections show that by 2028, three million osteotomies will occur for the treatment of osseous fractures. Bone grafting and 3D-biofabrication of osteoconductive scaffolds have emerged as viable medical methods in clinical practice for treatment of bone pathology. In addition, advanced additive manufacturing techniques have been successfully utilized for the fabrication of biocompatible, biodegradable, and patient-specific bone tissue scaffolds. It remains unknown how bone scaffolding materials (such as calcium phosphate ceramics, CPC) influence the mechanical and biomedical properties of fabricated bone scaffolds. Therefore, there is a need for investigation of the functional properties of potential bone scaffolding materials. In absence of such knowledge, the fabrication of bone scaffolds will remain sub-optimal and will not tailor the medical needs of patients. The long-term goal of the work is to fabricate patient-specific and biocompatible bone tissue scaffolds for treatment of bone diseases. The objective of the work is to synthesize, fabricate, and characterize CPC-based scaffolds with optimal biomedical and mechanical properties. To materialize this objective, a wide range of CPC scaffolds will be designed, synthesized, and 3D-biofabricated. In addition, the functional properties of the fabricated scaffolds will be characterized using techniques, such as X-ray Diffraction, live/dead cellular analyses, and compression testing. There are, potentially, material synthesis-related challenges that will be addressed with consideration of alternative materials and synthesis methods. Overall, this project will contribute toward the effective recovery of patients who have suffered from bone-related injuries.

Funding: NASA

122. American Heroes in Hoop Skirts: Examining the Legacies of Two Civil War Spies

Brandi Blake (Mac Arthur, West Virginia)

Institution: Concord University
Field: Humanities (History)
Faculty Advisor: Jonathan Berkey

During the American Civil War, Confederate Rose O'Neal Greenhow and Unionist Elizabeth Van Lew risked their lives to shape the conflict in unthinkable ways for nineteenth century ladies. They operated spy rings, used coded messages, and used their societal influence to gain access to confidential information. Greenhow delivered intelligence that changed the outcome of the First Battle of Bull Run. Van Lew assisted in the escape of Union soldiers from the horrific conditions of Libby Prison. Though both of these women's espionage operations were incredibly similar, their Reconstruction-era reputations could not be more different. Greenhow died due to drowning in 1864, but was lauded internationally. Van Lew was heavily ostracized in post-war Richmond and eventually died in poverty. Greenhow wrote a book on their experiences, while Van Lew was notorious for destroying much of her correspondence. The purpose of this research is to determine whether the interpretations of Greenhow and Van Lew's legacies by contemporaries and scholars are supported through documented evidence. This study uses sources like Rose's autobiography, correspondence, documents from the Library of Congress, and secondary sources such as a biography and book detailing female spies in the Civil War to provide insight into the lives of the two women. It also examines potential causes for the differential treatment of Greenhow and Van Lew within Reconstruction era, and how their legacies are scrutinized in modern times.

Funding: McNair Scholars Program

123. Dendroecological Potential of Riverscour Woodland Tree Species

Haidyn DePinho (Pennsboro, West Virginia)

Institution: Concord University
Field: Social Sciences (Geography)
Faculty Advisor: Tom Saladyga

Appalachian riverscour woodlands are frequently flooded areas characterized by exposed bedrock and poorly developed sandy soils, high plant diversity, and scattered and stunted trees. These sites are negatively impacted by dam construction and alterations to river hydrology, trampling associated with riverside recreation activities, and non-native species. In West Virginia, little is known about the development of riverscour woodlands or the growth and climate sensitivity of associated tree species. In this study, we evaluated the dendroecological potential of riverscour woodland trees by sampling multiple species at one 0.3-hectare riverscour woodland site within New River Gorge National Park and Preserve. Tree cores were collected from 33 trees (10 species) ranging from 8 to 43 cm at breast height (median = 21.6 cm). The oldest trees at the site established in the 1940s and 1950s, while most trees were less than 50 years old. All tree species exhibited highly variable annual growth with the exception of the youngest individuals (< 20 years old). Tree growth was notably suppressed in all species during the 1980s, which included both dry (low flow) and wet (high flow) growing season hydrological conditions. These initial findings deserve further investigation and suggest that a dendroecological analysis of riverscour woodland trees can provide new insights for the management of these dynamic riparian plant communities.

Funding: McNair

124. Using Microwaves to Accelerate the Preparation of Emissive Rare Earth Materials for Security Inks

Ciersten Rose (Lashmeet, WV)

Institution: Concord University
Field: Sciences (Chemistry)
Faculty Advisor: Rodney Tigaa

Rare earths such as the lanthanide ions, Ln(III), continue to receive much attention due to their unique properties for modern technological applications. This has resulted in lanthanides being classified as critical materials which has geopolitical and economic implications. Thus, there remains a need to investigate the chemistry of these elements. The goal of the proposed work was to synthesize and characterize polybenzimidazole derivatives to selectively coordinate Ln(III) ions and tune their optical properties for security inks. Through this work, we successfully developed a new microwave method for preparing tris-(2-benzimidazolylmethyl)amine (BimH3) and tri-ethyl triethyl 2,2′,2″(2,2′,2″nitrilotris(methylene)tris(1H-benzimidazole-2,1-diyl)) triethanoate (BimOEt3) in up to 30% yield. Analysis of the obtained samples by a combination of structural and optical methods indicated successful synthesis of the BimH3 and BimOEt3 ligands. Further, we synthesized water-soluble red-emitting Eu(III) and green-emitting Tb(III) complexes of the BimOEt3 ligand. The photophysical studies of the prepared complexes, as well as work to improve the yield and to design new ligands will be discussed. This work was supported by the Concord University McNair Program, Faculty-Student Research Fund, and the Tigaa Research Lab.

Funding: Sciences

125. The Effects of Stress on the Short-term Memory of Athletes

Courtney Smith (Fayetteville, WV)

Institution: Concord University
Field: Other (Psychology)
Faculty Advisor: Rodney Klein

Short term memory is a widely studied construct due to its prevalence in essential cognitive functions. However, there is significantly less research that specifically examines the effects of stress on short-term memory with athletes as participants. The current study consisted of 20 college, female, athletes and examined how stress, in the form of an ice bath, affected short term memory. The results were observed through the use of a 3-trial recall memory task. Although the results were in the direction hypothesized, with the athletes that were exposed to stress recalling slightly fewer items than the non-stressed athletes, the results were not statistically significant. The results suggest that athletes who are accustomed to ice baths may no longer be susceptible to the negative effects of the cold-water stressor, consistent with models of working memory.

126. Is there a correlation between chosen college major and mental health disorders?

Sarah Joyce (Poca, West Virginia)

Institution: University of Charleston
Field: Social Sciences (Psychology)
Faculty Advisor: Michael Bayly

This research study aims to see if there is a link between college major and mental health disorders, like depression, anxiety, ADHD, and autism. The hypothesis is that psychology majors will exhibit a higher rate of mental problems. Research on mental health professionals show that large percentage (61%) have diagnosed mental health issues and receive treatment themselves (Gilroy, et. al., 2002). This study was done in 2002 and the rates seem to have gone up since then. Through this research, I hope to gain an understanding on college students and their general mental health and which populations of college students may need more access to mental health services than others. In this study, participants will receive, via email with link or scannable QR code, the mental health questionnaire via Google Forms. In the beginning of the questionnaire a copy of the informed consent page is provided. After the questionnaire has been answered, a copy of the debriefing statement is contained at the end, and they are thanked for participating. All participants will be at least aged 18 or older and all University of Charleston students, and all identifying information will be excluded and omitted from the study.

127. Learning Cybersecurity with Automatic Machine Learning Based Feedback

Neil Loftus (Huntington, WV)

Institution: Marshall University
Field: Technology (Computer Science)
Faculty Advisor: Husnu Narman

Cybersecurity can often be a difficult subject for students to understand. Hands-on learning through labs and simulations can help students become more familiarized with the subject, but there is a balance between making the content easy to understand while not oversimplifying or misrepresenting the content. Through use of machine learning, this balance can be more easily maintained. The goal of this project is to improve upon a Cybersecurity Simulation by making the content more accurate and in depth. To counteract the difficulty increase from these improvements, a system of automatic feedback was developed using machine learning and natural language processing to correct users when they make typographical errors. A student trial was performed with students completing a survey before and after using the application. These survey results were then compared with results from a previous version of the application to measure how the machine learning system affected user feedback. The updated version of the application with machine learning functionality had a net increase in the user ratings of almost every survey field, with students notably rating the application's user friendliness and overall experience as significantly higher compared to the original application.

Funding: Marshall University

128. Emergency Contraceptive Availability In Us Colleges & Universities

Rachael Hubert (Pittsburgh, Pennsylvania)

Institution: West Virginia University
Field: Humanities (Biology)
Faculty Advisor: Cassidy Kidwell

Objectives: In 2013, the Food and Drug Administration removed the age requirement granting emergency contraceptives (EC) like Plan B® and other generic brands such as Ella to be available without a prescription. The Barrier of misinformation regarding the medication and who can obtain it makes access more difficult. Using mystery caller methodology, we conducted a study using scripted questions to ask university personnel about the requirements of obtaining EC and when it should be taken to lower the risk of pregnancy.

Methods: Scripted phone calls were made to colleges and universities across the US, however, they were not recorded. Information about the call was immediately transferred to the database RedCap from 8 trained female students. The calls were made between 8 AM and 5 PM starting November of 2021. With consideration that not all colleges or universities have student health centers, a separate script was made to assess the head of the dean of students or a tile IX coordinator.

Results: at this time the following variables may need to be assessed. If EC is unavailable will it be referred elsewhere? If so where? Other topics that need to be taken into consideration are the number of students living on campus and their demographic as well as if the school is a public or private institution. Challenges to be anticipated may include needing to provide identification and having to prove to be a current student at the college or university.

Conclusions: In spite of the fact of these challenges pursuing a mystery caller methodology ensures an accurate representation of what a student may face when trying to obtain EC. Accurate information about EC is vital to prevent pregnancy as there is a narrow window of efficiency. Student health centers and Title IX coordinators are responsible for providing adequate care to their students. Breaking the barrier of misinformation on EC is essential to prevent pregnancies among college students.