16th Annual Undergraduate
RESEARCH DAY AT THE CAPITOL

FEBRUARY 26, 2019

I. PARTICIPANTS BY HOUSE DISTRICT (as provided by participants)

House #	Participant		Poster #
1	Adam	O'Hara	76
	Austin	Paul-Orecchio	28
2	Rhiannon	Macom	14
	Brooklyn	Wilson	63
3	Daniel	Baker	45
	Margaret	Childers	86
	Maria	Ducci	65
	Emily	Huff	13
	Victoria	Irr	44
	Skylar	Minzler	67
	Jessye	Sutton	68
	Tiffany	Wimmer	62
5	Brooke	Hostetler	70
	Colton	Ring	18
	Sydney	Waugh	19
	Zachery	Yeater	68
6	Shianne	Ferrell	74
8	Amal	Khan	82
9	Misa	Amane	4
10	Laykin	Beardsley	55
	Katelyn	Bond	54
	Nicholas	Shower	75
	Aaron	Stavrakis	51
	Grant	Tennant	34
	Erica	Tracewell	66
	Tyra	West	77
12	Nolan	Holley	5
13	Christopher	Bias	26
	Maureen	Russell	79
15	Samantha	Phelix	7
	Chantz	Rankin	35
	Charles	Simpson	61
16	Jacob	Finton	94
	Bryan	Groves	92
	Anh	Nguyen	94
	Kelsea	Pingley	78
	Akhil	Purapalli	48
	Brooke	Rumbaugh	47
	Rae	Stanley	3
	Geanina	Tambaliuc	93
	Megan	Wetzel	55
17	Aryanna	Jones	15
	Katelyn	McCormick	89
	Silvana	Slusarciuc	15
18	Ellie	White	69

19	Sarah	Nickel	25
20	Faith	Hensley	33
	Bradley	Muncy	21
	Walter	Warden	80
22	Zachery	Donnellan	23
	Alex	Kayuha	48
	Andrew	McGrady	31
24	Daniel	Sunderland	12
27	Gezelle	Brown	97
	John	Cline	30
	Raenel	Crenshaw	98
	Emily	Davis	87
	Kristiana	Sklioutovskaya-Lopez	20
29	Nicole	Fama	8
	Emily	Rainey	64
	Brett	Smith	43
30	Takoda	Grove	39
31	Kasey	Blankenship	24
	Thomas	Carter	40
	Jeffrey	Gaiser	38
	Philip	Hager	39
	Madison	Mallory	26
	Ana	Monteiro	42
	Bimarsh	Sharma	40
31	Samantha	Adams	88
32	Sydney	Hughes	83
35	Allan	Balunovic	91
	Madison	Riffe	7
	Peyton	Seabolt	91
	Steven	Snedegar	16
	Chinyere	Ugwuanyi	11
36	Brittany	Graham	9
	Anusha	Sheikh	84
	David	Stone	24
37	Tat'ana	Dillard-Sims	9
	Jonathan	Musselwhite	36
	Ja'Keshia	Peterson	9
	Oruada	Ukiwo	32
38	Hunter	Aliff	6
	Kathryn	Taylor	49
	Mya	Vannoy	56
	Nathan	Weese	35
39	James	Shafer	95
40	Jordan	Vance	57
41	Ashton	Mullens	21
42	Alyssa	Harnish	90

43	MacKinzie	Smith	60
45	Reno	Cutright	96
48	Olivia	Friel	1
	Eva	MacFarland	81
49	Jasmine	Grossman	22
	Liza	Grossman	49
51	Avery J	Field	29
	Rachel	Gantzer	27
	Jesse	Goodman	41
	Annalisa	Huckaby	58
	Muriithi-David	Kem	46
	Travis	Rawson	57
	Kenyane	Simpson	72
	Brishti	White	52
52	Emma	McClelland	37
56	Olivia	Young	2
58	Nathan	Quarantillo	80
59	Jessica	Hogbin	71
61	Juliana	O'Reilly	59
65	Keegan	Mahoney	80
67	Christian	Weir	85

II. PARTICIPANTS BY SENATE DISTRICT (as provided by participants)

Senate #	Participant		Poster #
1	Margaret	Childers	86
	Emily	Huff	13
	Victoria	Irr	44
	Rhiannon	Macom	14
	Skylar	Minzler	67
	Austin	Paul-Orecchio	28
	Jessye	Sutton	68
	Brooklyn	Wilson	63
2	Daniel	Baker	45
	Maria	Ducci	65
	Shianne	Ferrell	74
	Brooke	Hostetler	70
	Muriithi-David	Kem	46
	Colton	Ring	18
	Kenyane	Simpson	72
	Zachery	Yeater	68
3	Katelyn	Bond	54
	Nicholas	Shower	75
	Aaron	Stavrakis	51
	Grant	Tennant	34
	Erica	Tracewell	66
	Tyra	West	77

4	Nolan	Holley	5
	Alex	Kayuha	48
	Amal	Khan	82
	Samantha	Phelix	7
	Chantz	Rankin	35
5	Laykin	Beardsley	55
	Jacob	Finton	94
	Bryan	Groves	92
	Anh	Nguyen	94
	Sarah	Nickel	25
	Kelsea	Pingley	78
	Brooke	Rumbaugh	47
	Charles	Simpson	61
	Rae	Stanley	3
	Geanina	Tambaliuc	93
	Ellie	White	69
6	Gezelle	Brown	97
	John	Cline	30
	Raenel	Crenshaw	98
	Emily	Davis	87
	Brittany	Graham	9
	Faith	Hensley	33
	Bradley	Muncy	21
	Kristiana	Sklioutovskaya-Lopez	20
	Sydney	Waugh	19
	Tiffany	Wimmer	62
7	Zachery	Donnellan	23
	Andrew	McGrady	31
	Daniel	Sunderland	12
	Walter	Warden	80
8	Hunter	Aliff	6
	Christopher	Bias	26
	Jonathan	Musselwhite	36
	Maureen	Russell	79
	James	Shafer	95
	Steven	Snedegar	16
	Kathryn	Taylor	49
	Oruada	Ukiwo	32
	Jordan	Vance	57
	Nathan	Weese	35
9	Samantha	Adams	88
	Misa	Amane	4
	Nicole	Fama	8
	Jeffrey	Gaiser	38
	Takoda	Grove	39
	Philip	Hager	39

	Sydney	Hughes	83
	Ana	Monteiro	42
	Emily	Rainey	64
	Bimarsh	Sharma	40
	Brett	Smith	43
10	Alyssa	Harnish	90
	Adam	O'Hara	76
	Megan	Wetzel	55
11	Reno	Cutright	96
	Ashton	Mullens	21
	MacKinzie	Smith	60
12	Olivia	Friel	1
	Eva	MacFarland	81
13	Annalisa	Huckaby	58
	Avery J	Field	29
	Rachel	Gantzer	27
	Jesse	Goodman	41
	Annalisa	Huckaby	58
	Travis	Rawson	57
	Brishti	White	52
14	Jasmine	Grossman	22
	Liza	Grossman	52
	Emma	McClelland	37
	Olivia	Young	2
15	Jessica	Hogbin	71
	Nathan	Quarantillo	80
16	Keegan	Mahoney	80
	Juliana	O'Reilly	59
	Christian	Weir	85
17	Allan	Balunovic	91
	Kasey	Blankenship	24
	Tat'ana	Dillard-Sims	9
	Aryanna	Jones	15
	Madison	Mallory	26
	Katelyn	McCormick	89
	Ja'Keshia	Peterson	9
	Madison	Riffe	7
	Peyton	Seabolt	91
	Anusha	Sheikh	84
	Silvana	Slusarciuc	15
	David	Stone	24
	Chinyere	Ugwuanyi	11
	Mya	Vannoy	56

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

State/Country	Participant		Poster #
Canada	Matthew	Rosolen	60
DE	Taylor	Bunting	50
MD	Hannah	Belt	73
PA	Grace	Nowicki	53
VA	Chere	Davis	17
	Abigail	Withrow	50
Unspecified	Thomas	Carter	40
	Abigail	Johnson	59
	Karly	Judy	86
	Caryce	McGurn	86
	Nolan	Mull	41
	Albert	Nunez	41
	Karli	Ray	67
	Jerrold	Taylor	36
	Jordan	Thompson	36
	Vijaya	Valiveti	48

IV. PARTICIPANTS BY FIELD (first authors only)

Agriculture

		Poster Number
Olivia	Friel	1

Astronomy

		Poster Number
Rae	Stanley	3
Ellie	White	69
Olivia	Young	2

Biochemistry

		Poster Number
Hunter	Aliff	6
Misa	Amane	4
Nolan	Holley	5
Kathryn	Taylor	49

Biology

		Poster Number
Chere	Davis	17
Nicole	Fama	8
Annalisa	Huckaby	58
Emily	Huff	13
Rhiannon	Macom	14
Zedan	Martin	10
Ja'Keshia	Peterson	9
Emily	Rainey	64
Madison	Riffe	7
Colton	Ring	18
Matthew	Rosolen	60

Silvana	Slusarciuc	15
Steven	Snedegar	16
Aaron	Stavrakis	51
Daniel	Sunderland	12
Chinyere	Ugwuanyi	11
Sydney	Waugh	19

Biomedical		**Poster Number**
Gezelle	Brown	97
Raenel	Crenshaw	98
Jasmine	Grossman	22
Bradley	Muncy	21
Juliana	O'Reilly	59
Kristiana	Sklioutovskaya-Lopez	20
Tiffany	Wimmer	62

Chemistry		**Poster Number**
Christopher	Bias	26
Zachery	Donnellan	23
Rachel	Gantzer	27
Sarah	Nickel	25
Austin	Paul-Orecchio	28
David	Stone	24
Brooklyn	Wilson	63

Communications/Journalism		**Poster Number**
Hannah	Belt	73
Shianne	Ferrell	74

Computer Science		**Poster Number**
Jesse	Goodman	41
Bryan	Groves	92
Anh	Nguyen	94
Peyton	Seabolt	91
Bimarsh	Sharma	40
Geanina	Tambaliuc	93

Criminal Justice		**Poster Number**
Adam	O'Hara	76
Kelsea	Pingley	78
Nicholas	Shower	75
Tyra	West	77

Disability Research		Poster Number
Skylar	Minzler	67
Grace	Nowicki	53

Ecology		Poster Number
Emma	McClelland	37

Education		Poster Number
Jessye	Sutton	68
Erica	Tracewell	66

Engineering		Poster Number
Daniel	Baker	45
Victoria	Irr	44
Alex	Kayuha	48
Muriithi-David	Kem	46
Ana	Monteiro	42
Brooke	Rumbaugh	47
Brett	Smith	43

Environmental Studies		Poster Number
Jeffrey	Gaiser	38
Philip	Hager	39

Forensic Science		Poster Number
Avery J	Field	29

Geography		Poster Number
John	Cline	30

Geology		Poster Number
Andrew	McGrady	31
Oruada	Ukiwo	32

History		Poster Number
Jessica	Hogbin	71
Brooke	Hostetler	70

Immunology/Medical Microbiology		Poster Number
Travis	Rawson	57
Mya	Vannoy	56

Mathematics		Poster Number
Faith	Hensley	33

Music		Poster Number
Maria	Ducci	65

Neuroscience		Poster Number
Brishti	White	52

Physics		Poster Number
Jonathan	Musselwhite	36

History		Poster Number
Nathan	Quarantillo	80
Maureen	Russell	79

Psychology		Poster Number
Samantha	Adams	88
Margaret	Childers	86
Emily	Davis	87
Sydney	Hughes	83
Amal	Khan	82
Eva	MacFarland	81
Anusha	Sheikh	84
Christian	Weir	85

Sociology/Social Work		Poster Number
Alyssa	Harnish	90
Katelyn	McCormick	89

Unspecified		Poster Number
Laykin	Beardsley	55
Katelyn	Bond	54
Taylor	Bunting	50
Reno	Cutright	96
Chantz	Rankin	35
James	Shafer	95
Charles	Simpson	61
Kenyane	Simpson	72
Grant	Tennant	34

V. PARTICIPANTS BY BROAD CATEGORY (first authors only)

Creative Arts		Poster Number
Maria	Ducci	65

Engineering		Poster Number
Daniel	Baker	45
Jesse	Goodman	41
Jasmine	Grossman	22

Philip	Hager	39
Victoria	Irr	44
Alex	Kayuha	48
Muriithi-David	Kem	46
Ana	Monteiro	42
Jonathan	Musselwhite	36
Chantz	Rankin	35
Brooke	Rumbaugh	47
Brett	Smith	43

Health Sciences		Poster Number
Laykin	Beardsley	55
Katelyn	Bond	54
Taylor	Bunting	50
Annalisa	Huckaby	58
Grace	Nowicki	53
Juliana	O'Reilly	59
Emily	Rainey	64
Travis	Rawson	57
Matthew	Rosolen	60
Charles	Simpson	61
Aaron	Stavrakis	51
Kathryn	Taylor	49
Mya	Vannoy	56
Brishti	White	52
Brooklyn	Wilson	63
Tiffany	Wimmer	62

Humanities		Poster Number
Jessica	Hogbin	71
Brooke	Hostetler	70

Sciences		Poster Number
Hunter	Aliff	6
Misa	Amane	4
Christopher	Bias	26
Gezelle	Brown	97
Margaret	Childers	86
John	Cline	30
Raenel	Crenshaw	98
Chere	Davis	17
Emily	Davis	87
Zachery	Donnellan	23
Nicole	Fama	8
Avery J	Field	29
Olivia	Friel	1
Jeffrey	Gaiser	38

Rachel	Gantzer	27
Faith	Hensley	33
Nolan	Holley	5
Emily	Huff	13
Rhiannon	Macom	14
Zedan	Martin	10
Emma	McClelland	37
Andrew	McGrady	31
Bradley	Muncy	21
Sarah	Nickel	25
Austin	Paul-Orecchio	28
Ja'Keshia	Peterson	9
Madison	Riffe	7
Colton	Ring	18
Bimarsh	Sharma	40
Kristiana	Sklioutovskaya-Lopez	20
Silvana	Slusarciuc	15
Steven	Snedegar	16
Rae	Stanley	3
David	Stone	24
Daniel	Sunderland	12
Grant	Tennant	34
Chinyere	Ugwuanyi	11
Oruada	Ukiwo	32
Sydney	Waugh	19
Olivia	Young	2

Social Sciences		Poster Number
Samantha	Adams	88
Hannah	Belt	73
Shianne	Ferrell	74
Alyssa	Harnish	90
Sydney	Hughes	83
Amal	Khan	82
Eva	MacFarland	81
Katelyn	McCormick	89
Adam	O'Hara	76
Kelsea	Pingley	78
Nathan	Quarantillo	80
Maureen	Russell	79
Anusha	Sheikh	84
Nicholas	Shower	75
Jessye	Sutton	68
Christian	Weir	85
Tyra	West	77

Technology		Poster Number
Reno	Cutright	96
Bryan	Groves	92
Anh	Nguyen	94
Peyton	Seabolt	91
James	Shafer	95
Geanina	Tambaliuc	93

Unspecified		Poster Number
Skylar	Minzler	67
Kenyane	Simpson	72
Erica	Tracewell	66
Ellie	White	69
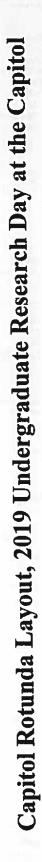
VI. PARTICIPANTS BY INSTITUTION (first authors only)
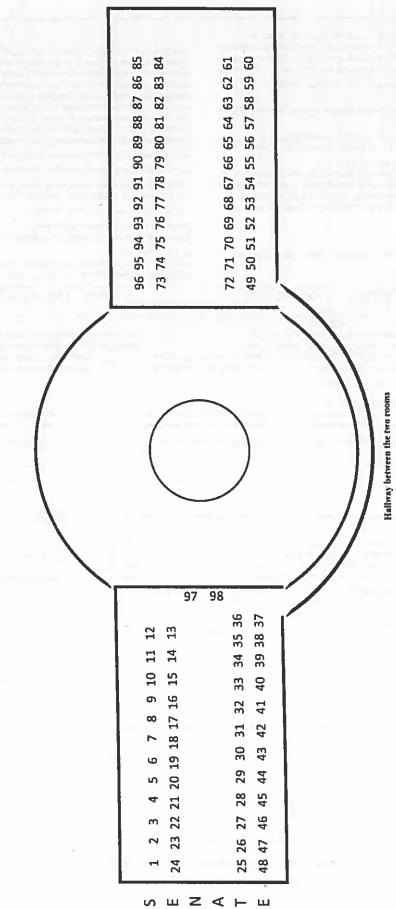
Alderson Broaddus University		Poster Number
Emily	Rainey	64

Bethany College		Poster Number
Rachel	Gantzer	27
Austin	Paul-Orecchio	28
Brooklyn	Wilson	63

Bluefield State College		Poster Number
Gezelle	Brown	97
Raenel	Crenshaw	98

Concord University		Poster Number
John	Cline	30
Emily	Davis	87
Alyssa	Harnish	90
Sydney	Waugh	19
Tiffany	Wimmer	62

Fairmont University		Poster Number
Reno	Cutright	96
Nathan	Quarantillo	80
James	Shafer	95

Glenville State College		Poster Number
Chere	Davis	17
Colton	Ring	18

Marshall University		Poster Number
Bryan	Groves	92
Faith	Hensley	33
Alex	Kayuha	48
Katelyn	McCormick	89
Bradley	Muncy	21
Anh	Nguyen	94
Sarah	Nickel	25
Kelsea	Pingley	78
Chantz	Rankin	35
Brooke	Rumbaugh	47
Charles	Simpson	61
Rae	Stanley	3
Geanina	Tambaliuc	93
Ellie	White	69

Ohio Valley University		Poster Number
Adam	O'Hara	76
Nicholas	Shower	75
Tyra	West	77

Shephard University		Poster Number
Christian	Weir	85

University of Charleston		Poster Number
Sydney	Hughes	83
Matthew	Rosolen	60
Maureen	Russell	79
Anusha	Sheikh	84
Kristiana	Sklioutovskaya-Lopez	20
Silvana	Slusarciuc	15
Steven	Snedegar	16

West Liberty University		Poster Number
Emily	Huff	13
Rhiannon	Macom	14
Emma	McClelland	37
Skylar	Minzler	67
Jessye	Sutton	68

West Virginia State University		Poster Number
Hunter	Aliff	6
Christopher	Bias	26
Zedan	Martin	10
Jonathan	Musselwhite	36
Ja'Keshia	Peterson	9
David	Stone	24
Daniel	Sunderland	12
Chinyere	Ugwuanyi	11
Oruada	Ukiwo	32

West Virginia University		Poster Number
Daniel	Baker	45
Laykin	Beardsley	55
Hannah	Belt	73
Katelyn	Bond	54
Taylor	Bunting	50
Zachery	Donnellan	23
Maria	Ducci	65
Maria	Ducci	65
Nicole	Fama	8
Shianne	Ferrell	74
Avery	Field	29
Olivia	Friel	1
Jesse	Goodman	41
Jasmine	Grossman	22
Jessica	Hogbin	71
Nolan	Holley	5
Brooke	Hostetler	70
Annalisa	Huckaby	58
Victoria	Irr	44
Muriithi-David	Kem	46
Amal	Khan	82
Eva	MacFarland	81
Andrew	McGrady	31
Grace	Nowicki	53
Juliana	O'Reilly	59
Travis	Rawson	57
Madison	Riffe	7
Kenyane	Simpson	72
Aaron	Stavrakis	51
Kathryn	Taylor	49
Grant	Tennant	34
Erica	Tracewell	66
Mya	Vannoy	56
Brishti	White	52
Olivia	Young	2

West Virginia University Institute of Technology		**Poster Number**
Samantha	Adams	88
Misa	Amane	4
Jeffrey	Gaiser	38
Philip	Hager	39
Ana	Monteiro	42
Peyton	Seabolt	91
Bimarsh	Sharma	40
Brett	Smith	43

Wheeling Jesuit University		**Poster Number**
Margaret	Childers	86

Capitol Rotunda Layout, 2019 Undergraduate Research Day at the Capitol

HOUSE

96 95 94 93 92 91 90 89 88 87 86 85
73 74 75 76 77 78 79 80 81 82 83 84

72 71 70 69 68 67 66 65 64 63 62 61
49 50 51 52 53 54 55 56 57 58 59 60

Hallway between the two rooms

97 98

SENATE

1 2 3 4 5 6 7 8 9 10 11 12
24 23 22 21 20 19 18 17 16 15 14 13

25 26 27 28 29 30 31 32 33 34 35 36
48 47 46 45 44 43 42 41 40 39 38 37

1. Nutrient uptake analysis of light and hormone insensitive Arabidopsis thaliana mutants

Olivia Friel (Harrison, WV)

Institution: West Virginia University
Field: Sciences (Agriculture)
Faculty Advisor: Nicole Waterland

Development of plants enriched with minerals is beneficial to improve the quality of agricultural crops, but the effects of major players, light and plant hormones, on mineral uptake are not clearly understood. It is hypothesized that genes encoding light receptors and involving in hormone biosynthesis would affect the mineral uptake in plants. *Arabidopsis thaliana* mutants insensitive to red or blue light (11 mutants), and to plant hormones (7 mutants) including ethylene, gibberellic acid, or jasmonic acid, were selected in our study. Mutants were grown for eight weeks from seeds in the greenhouse with 1/5th strength of Hoagland solution. Leaf tissues were harvested, freeze-dried, ground to a fine powder, and the mineral contents were analyzed using an inductively coupled plasma spectrometer. Comparisons among five macro and four micronutrients were conducted among mutants and a wild type. Ca content was lower in all light insensitive mutants except Ado1 (Adagio1) and Ado3. For potassium uptake, cca1-1 (Circadian Clock Associated 1-1) showed lower uptake, while pif3 (Phytochrome Interacting Factor 3) showed higher uptake. For hormone mutants, jasmonate insensitive mutants showed lower Ca uptake, while ethylene mutant (etr1-1) exhibited lower potassium uptake. The knowledge obtained from this study will allow us to ameliorate nutrient uptake in food crops. It will benefit our society by improving our diet to reduce nutrient deficiency, reduce the risk of disease and improve overall human health.

2. Pulsar and Fast Radio Burst Searching with the 20m Telescope at Green Bank Observatory

Olivia Young (Mineral, West Virginia)

Institution: West Virginia University
Field: Sciences (Astronomy)
Faculty Advisor: Maura McLaughlin

My research focuses on identifying radio emissions from pulsars and Fast Radio Bursts (FRBs) with the 20 m telescope at the Green Bank Observatory. Pulsars are neutron stars that are very dense and have high rates of rotation, resulting in beams of radio waves emitted from their magnetic poles. Pulsars can be used as probes to discover the composition of our galaxy and to detect the passing of gravitational waves. Fast Radio Bursts are millisecond long bursts of radio waves that have been confirmed to come from outside of our own galaxy. However, astronomers have been unable to discover their cause. My project focuses on detecting pulsars and FRBs using a pipeline that is triggered when the 20m telescope receives a signal that appears to be from a pulsar of FRB. I then process the data that is captured into readable plots to be searched through for potential candidates. In addition, these plots will also be used as a training ground for Machine Learning Code. Machine Learning is an up and coming area of astronomy that focuses on automating many tasks and helping to make the most of data that has been collected. My project allows me to be able to participate in exciting areas of research and is helping me to develop skills that I will use in the future to build a successful career and further the cause of astronomy in West Virginia.

3. A Spectroscopic Study of Narrow-Line Seyfert-1 Galaxies

Rae Stanley (Cabell, WV)

Institution: Marshall University
Field: Sciences (Astronomy)
Faculty Advisor: Jon Saken

Narrow-line radio-loud Seyfert-1 galaxies are a class of galaxies that are identified by their H-beta absorption lines and their emission of synchrotron radiation in the radio (Foschini et. al. 2014). Some of these galaxies have been observed emitting gamma radiation, suggesting the presence of relativistic jets originating from the black hole in the galactic center (Foschini 2013). It is not well understood why these galaxies emit relativistic jets, because their black holes are thought to be too small to accrete matter quickly enough to emit them (Foschini 2013). In addition to the mystery surrounding accretion rate, Cameron (2001) suggests that interactions of ejected material from r jets formed from neutron stars genesis in supernovae with the accretion disk surrounding it could facilitate r-process nucleosynthesis up to A=132 and could account for the diverse abundance of isotopes in the universe. He also notes that this process in core collapse supernovae also creates black holes in more massive stars. Since supermassive black holes at the centers of our studied galaxies emit jets and therefore are assumed to have an accretion disk, it may be theoretically possible that these supermassive black holes are facilitating r-process nucleosynthesis by the same mechanism. Cameron (2001) also notes that these r-process jets are identified by gamma-ray emission. Using optical spectra taken by the Vatican Advanced Technology Telescope, we measure the black hole mass of a sample of 5 gamma ray emitting, narrow-line radio-loud Seyfert-1 galaxies and measure the abundance of Nickel and Aluminum - two r-process elements.

4. Design of Clean Fossil Fuel Plants to Capture and Convert Carbon Dioxide to Ethanol

Misa Amane (Raleigh, WV)

Institution: West Virginia University Institute of Technology
Field: Sciences (Biochemistry)
Faculty Advisor: Richard Squire

The debate about the pollution from fossil-fueled electric power plants is important because these plants generate 80% of the world's energy. A modern coal-fired generating facility will control nitrous oxides , sulfur oxides , and meet Mercury Air Toxic Standards (MATS). But these plants have been and still are polluters emitting carbon dioxide which is a major component of global warming. A 500-megawatt coal power plant generates about 10,000 tons of each day. Currently, capturing the emissions requires 30% of the energy generated by a plant. We propose process steps to capture and convert more than 80% of the generated into ethanol that will provide enough energy to both power the capture from the original emissions and generate ethanol to sell or use as fuel. Our conversion of to ethanol does not use arable farm land and can use brackish water, so to convert the 10,000 tons of above to ethanol, a bio-ranch just needs sunlight and nutrients. The capture of the could be powered by the recovered ethanol, so this now pristine electric power generation plant recycles 95% of the it generates.

5. Identification of a sulfonamide analog that reduces cell viability in acute lymphoblastic leukemia

Nolan Holley (Jackson, WV)

Institution: West Virginia University
Field: Sciences (Biochemistry)
Faculty Advisor: Laura Gibson

Survival of leukemic cells within the bone marrow (BM) microenvironment has been determined to be associated with disease relapse in acute lymphoblastic leukemia (ALL). Identification of novel therapies that target the leukemic niche and sensitize the resistant leukemic cells to chemotherapy resulting in its eradication remains an ongoing pursuit. Towards this goal, a library of 41 compounds that are members of a sulfonamide chemical family were utilized in a cell viability screening assay. Our initial primary screening in REH and TOM-1 ALL cells identified the sulfonamide analog, N-{4-[2-(3,4-dimethoxyphenyl)-2-oxoethyl]-2-[2-(2,5-dimethylphenyl)ethyl]phenyl}-N-methylmethanesulfonamide (compound B4) as a potential candidate. A secondary screening involving a concentration-dependent viability curve performed in 6 ALL cell lines validated the anti-leukemic activity of compound B4. Specifically, we found that compound B4 reduced cell viability in all the tested leukemic cell lines with TOM-1 being the most sensitive with an IC_{50} of 133 nM and BV173 being the most resistant with an IC_{50} of 323 nM. Taken together, our preliminary screening studies have identified B4 as a potential candidate for targeting and sensitizing leukemic cells. Future studies will be designed to determine the activity of compound B4 in an in vitro co-culture model that mimics the leukemic niche found in the BM of ALL patients.

6. Gene mapping of Soybeans and Biochemical Responses to Stress in Potato

Hunter Aliff (Kanawha, West Virginia)

Institution: West Virginia State University
Field: Sciences (Biochemistry)
Faculty Advisor: M.A. Saghai-Maroof

The goal of the first five weeks project was to identify simple sequence repeat (SSR) markers of disease resistance genes to *Phytophthora sojae*. We are looking for qualitative disease resistance (Rps) genes on chromosomes 3 and 13 using various primers on recombinant inbred lines (RILs) of soybeans. The goal of this project was accomplished by genetic mapping. The microsatellites tested on chromosome 3 and chromosome 13 did not come within a close enough range (5-6 cM) to be effectively used as molecular tags but they will add to the map and more markers will be tested on these two chromosomes in the future.

The goal of the second five weeks was to associate the activity of the Reactive Oxygen Species scavenging system with heat stressing conditions in potatoes. The activity of the reactive oxygen species (ROS) scavenging system increases when plants are subjected to stressing conditions. The objective of this study is to associate the activity of the ROS scavenging system with the incidence of IHN. This study will evaluate the activity of specific enzymes in the scavenging system and the increase/reduction of phenolic content in potato subjected to increasing field temperatures, along with membrane permeability.

7. Building a Brain: Studying Development of the Hypothalamus Using Zebrafish

Madison Riffe (Kanawha, WV)
Samantha Phelix (Putnam, WV)

Institution: West Virginia University
Field: Sciences (Biology)
Faculty Advisor: Sadie Bergeron

As an organism matures, it goes through neurodevelopment, the process of creating a properly functioning nervous system. During this process, it is crucial that the correct number and types of cells make it to the correct places. We are interested in the development of the hypothalamus, a specific area of the brain that controls many of our essential body functions such as growth, sleep, mood, and hunger. Cells in the hypothalamus communicate using neurotransmitters such as dopamine. Dysfunctions in dopamine signaling between cells is associated with disorders such as Schizophrenia and Parkinson's disease. Because of the wide and important roles of the hypothalamus, we want to better understand how different genes affect its development. We use the zebrafish, a small minnow-like fish, as a model organism to study development of the hypothalamus. Like humans, zebrafish are vertebrates, and they share many brain structures and genes with humans. One aspect that makes zebrafish a great tool to study gene function is the ability to create mutants and study the relatively rapid development of their brains. Our lab has created a line of zebrafish with a mutation in the gene *gsx1*. From studies of this line, we have found for the first time that this gene does not appear to affect the number of cells that will eventually become neurons in the hypothalamus, but it might have an effect on dopamine production in the hypothalamus, and thus the body functions dependent upon dopamine in zebrafish and humans.

8. Genetic diversity and morphological variation in a vulnerable West Virginia native orchid, *Corallorhiza bentleyi*

Nicole Fama (Raleigh, West Virginia)

Institution: West Virginia University
Field: Sciences (Biology)
Faculty Advisor: Craig Barrett

Bentley's coralroot (*Corallorhiza bentleyi*) is a rare orchid species endemic to just five counties along the border of West Virginia and Virginia; only 400 individuals have been identified in nature. The species is mycoheterotrophic, meaning it relies on a fungal host for nutrients and does not photosynthesize. This critically understudied species may be at risk of extinction due to small population sizes, a reliance on self-pollination, restricted geographic range, and a dependence on fungi for nutrition. Population genetics is a useful tool to address the life history of a species, and assess how populations have interacted over space and time based on genomic information. The purpose of this project is to identify how diverse Bentley's coralroot populations are, genetically and morphologically, to reveal how populations have emerged and interacted. This will inform how to direct conservational efforts towards the imperiled orchid. Analysis of inter-simple sequence repeat (ISSR) regions revealed evidence of genetic distinction between populations of *C. bentleyi*, with little genetic variation existing within populations. Floral measurements also showed distinction in the size of petals and reproductive parts of individuals in different populations. Fungal ITS sequences showed that *C. bentleyi* associates with only a single species of fungus, *T. fuscocinerea*. Ultimately, this research confirms these populations are genetically and morphologically-distinct, but that little variation within populations and reliance on a single host species still leaves them vulnerable. The loss of any of these orchid populations could reduce the evolutionary potential of the species, necessitating increased protection to ensure their survival.

9. Preliminary Molecular Assessment for the Phylogenetic Analysis of *Crataegus* species in West Virginia

Ja'Keshia Peterson (Kanawha, Kanawha)
Brittany Graham (McDowell, West Virginia)
Tat'ana (Kanawha, West Virginia)

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

Crataegus, commonly referred to as hawthorns, are small trees or shrubs in the Rosaceae family. In the past, hawthorns have only been categorized morphologically in West Virginia. Due to the reproductive abilities of the various *Crataegus* species, identification of them as separate species is nearly impossible. Hawthorns often have multiple ploidy levels and are also capable of reproducing via apomixis. Hawthorns are plants of interest due to their medicinal properties. With proper identification through molecular analysis there is a greater potential to capitalize and benefit from the use and production of native hawthorns. Tissues were obtained from the WVSU herbarium. Seeds were received from the U.S. National Arboretum and fresh tissue samples were collected from Minnesota and Greenbrier County, WV. The primers selected for evaluation, ITS1, ITS2, rbcL and matK, were used on 40 samples of *Crataegus* species. After extractions, PCR was run on each primer and the amplicons were evaluated via gel electrophoresis. ITS1 had a success rate of 85%; ITS2 had a success rate of 83%; rbcL had a success rate of 20%; matK 1 and matK 2 combined had a success rate of 7.5%. After modification of the primer's protocols, the matK primers were eliminated. Following modification, ITS1 has a success rate of 85%; ITS2 has a success rate of 92.5%; and rbcl has a success rate of 40%. Although there was an increase in success rates, double bands were present. Further modifications are being done to eliminate them and successfully sequence the *Crataegus* species.

10. Membrane Steroid Receptors in Brain Tumor Cells.

Zedan Martin (Jamaica)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Gerald Hankins

Brain tumors are the second leading cause of cancer-related death in young men and the fifth leading cause of cancer related deaths in young women. Meningiomas, tumors of the lining of the brain and spinal cord, are significantly more common in women than in men while tumors of glial cells (non-neuronal cells of the brain), referred to as gliomas, are more common in men. Glioma incidence increases drastically after puberty in males compared to females, with the difference in incidence increasing from puberty until the early fifty's. Further, glioblastomas transplanted into female animals grow slower than those transplanted into males. Because of this, it has been postulated that steroid sex hormones play a key role in brain tumor biology, however the mechanisms are not well understood. To date, most investigations have focused on classical steroid hormone receptors not bound to cell membranes. Activators of the membrane-bound G Protein coupled estrogen receptor (GPER1) have been shown to induce progesterone synthesis in brain cells. Progesterone acts not only through the classical progesterone receptor but also through membrane progesterone receptors (mPRs, also known as progestin and adipoQ receptor family members, PAQRs). We investigated response of human glioma and meningioma cells in culture to GPER1 and mPR activators by treating cells with progesterone, progesterone metabolites and a progesterone analog specific to mPRs (Org – OD-O2-O).

11. Anti-tumor effects of novel organometallic compounds

Chinyere Ugwuanyi (Kanawha, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Gerald Hankins

In recent years cancer survival rates have generally increased, but for many cancers the survival rates are still relatively low. Cisplatin and its derivative platinum based compounds, the most widely used metallic anti-tumor treatment drugs, have shown effectiveness in treating many cancers. However, cancers often grow resistant to it, hence the need for novel anti-tumor compounds. Ruthenium and Iridium based complexes have drawn interest as they are generally less toxic than the platinum-based compounds to normal cells. Further, complexes containing these metals may be activated by light at the site of the tumor to both increase their activity. This project tests the anti-tumor effects of photoactivatable organometallic compounds synthesized by Dr. Sharon Molnar. Bimetallic Ruthenium and Iridium based complexes were tested. The compounds tested were:

-Ir.dpp [(bpy)$_2$Ru(dpp)IrCp*Cl](PF$_6$)$_3$,
-Ir.dpq[(bpy)$_2$Ru(dpq)IrCp*Cl](PF$_6$)$_3$,
-Ir.dpb [(bpy)$_2$Ru(dpb)IrCp*Cl](PF$_6$)$_3$,
-(Ir.Cp*)$_2$dpb(PF$_6$)$_4$

The cells in tissue culture were plated and incubated for 24 hours after which they were treated with the compounds and exposed to different light wavelengths and incubated for another 24 hours. Relative numbers of viable cells were assayed using a WST-8 assay, which is based on the metabolic activity of cells, to evaluate the effectiveness of the compounds against the tumor cells.

12. Additional Sequencing of the Mitochondrial ND1 Gene of Paraorygmatobothrium of Sharks

Daniel Sunderland (Logan, WV)

Institution: West Virginia State University
Field: Sciences (Biology)
Faculty Advisor: Tim Ruhnke

The Phyllobothridean genus *Paraorygmatobothrium* contains species that are parasitic in sharks. Twenty-six species reside in the genus, but many remain yet to be described. The present study focused on generation of DNA sequence from Carcharhiniform sharks (genera *Sphyrna*, *Carcharhinus*, *Rhizoprionodon*, and *Hemitriakis*). Two different trials of PCR were conducted on the different samples of mtDNA that were obtained. Each trial consisted of a different set of primer combinations. PCR resulted in forty-four successful amplifications of the NADH dehydrogenase 1 (ND1) region of mitochondrial DNA. Fourteen of twenty-two of these samples were successfully sequenced for ND1. These sequences were aligned to existing sequences for other species. Neighbor-joining analysis revealed that seven species were successfully sequenced: *Paraorygmatobothrium christopheri*, *Paraorygmatobothrium sinclairtaylori*, *Paraorygmatobothrium SpF*, *Paraorygmatobothrium Sp4SC2017*, and the three new species *Paraorygmatobothrium spSEN*, *Paraorygmatobothrium SpDSun1*, and *Paraorygmatobothrium SpP536*.

13. *E. coli* in Urban Streams

Emily Huff (Ohio County, WV)

Institution: West Liberty University
Field: Sciences (Biology)
Faculty Advisor: James Wood

   Escherichia coli (*E. coli*) is a bacterium found in the lower intestines of warm blooded animals and high concentrations of *E. coli* in streams indicates that large amounts of feces from humans or other warm-blooded animals are entering the water. *E. coli* bacteria can cause water to become cloudy with an unpleasant odor and can be used as an indicator that human pathogenic bacteria and viruses could be present in the water. The US Environmental Protection Agency established a maximum safe limit of 151 colony forming units for recreational water usage but concentrations of *E. coli* can change rapidly with environmental conditions. We sought to investigate *E. coli* concentrations in Wheeling Creek, WV (a tributary to the Ohio River) because the creek is increasing in being utilized for recreational activities, but old wastewater infrastructure frequently discharges untreated sewage into the creek. We collected water samples at two sites along the Ohio River, five sites along Wheeling Creek, and three along tributaries of Wheeling Creek. Using the IDEXX Colilert System samples are transported to the laboratory on ice, mixed with an *E. coli* indicating reagent and then incubated for 24 hours. From the 57 samples collected, we have found that the concentrations range from 60 to 1900 colonies of *E. coli*, and only 9 readings (15.8%) were below the EPA safe standard for recreational usage with the highest readings occurring at sites along Wheeling Creek.

14. The Role of FTL_1228 in Erythrocyte Invasion by *Francisella tularensis*

Rhiannon Macom (Brooke, WV)

Institution: West Liberty University
Field: Sciences (Biology)
Faculty Advisor: Joseph Horzempa

   Francisella tularensis is a gram-negative bacterium and is the causative agent of tularemia- a disease more commonly known as 'rabbit fever'. This microbe is extremely virulent as inhalation of fewer than ten bacteria can lead to a lethal infection. During infection, *F. tularensis* replicates in cells of the immune system, such as macrophages, as well as other non-phagocytes such as epithelial cells and hepatocytes. Moreover, this bacterium has been shown to invade erythrocytes – a process that enhances colonization of ticks (a major disease vector). Our laboratory previously showed that a locus encoding a hypothetical gene, FTL_1228, was induced in the presence of erythrocytes. Therefore, we hypothesized that this gene may be responsible for invasion of these host cells. In this study, we mutated FTL_1228 of *F. tularensis* LVS and studies are ongoing to determine the role of this gene in erythrocyte invasion.

15. Microbial Lead resistance and solubilization in soil from a shooting range in WV.

Silvana Slusarciuc (Kanwha, WV)
Aryanna Jones (Kanawha, WV)

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

Studies have shown that outdoor shooting ranges are important sources of lead contamination in the environment. These soils are also teeming with microbial life who are capable of thriving in the highly contaminated soil. We sampled at the Kanawha State Forest outdoors shooting range in Charleston, WV since a previous study found soils at this site to have, on average, 7000 ppm of extractable lead. This represents a point source since the lead could potentially mobilize to nearby waterways. Our first study assessed the soil fungal community that may be playing a role in solubilizing lead by secreting organic acids. We used selective media to survey the culturable fungal species that also produced organic acids. Several isolates were found which were further tested using insoluble lead agar for their ability to solubilize lead. Areas of solubilized lead were measured in cultures of two fungal isolates which were further identified. Our second study assessed the culturable bacterial communities resistant to lead. We are currently testing bacterial isolates from the shooting range soils against different concentrations of lead (0 to 1000 ppm) hoping we will find maximum resistant concentrations. We will be performing some characterization of these isolates using standard microbiological techniques to identify the species. Further research will address the mechanisms by which these bacteria are detoxifying the lead. Together these results show that there are, within the same soil, organisms that can contribute to lead detoxification and organisms that may be contributing to lead mobilization into other trophic levels.

16. Fatal and behavioral effects that household cleaners pose to pets

Steven Snedegar (West Virginia)

Institution: University of Charleston
Field: Sciences (Biology)
Faculty Advisor: Heather Arnett

Frequent cleaning of a household is necessary to maintain sanitation, however houses are not well ventilated and cleaning products may contain eye, skin, and respiratory irritants. These irritants may affect pets due to their paws walking on surfaces, and them licking themselves clean; this makes it easy for pets to ingest chemicals. Sixty-five percent of West Virginia homeowners possess a pet which may be at risk to these chemicals (FOHO WV 2017). I performed this experiment because I am a West Virginian pet owner that wanted to determine if certain cleaning products can cause health complications in pets. Crickets were used as a model organism to mimic the behavior of pets in the household. The crickets were exposed for five days to low, medium and high concentrations of the cleaner, Formula 409. Food accumulation will be measured, and I expect for crickets in the highest concentration to consume the least amount of food, due to irritants affecting their desire to eat. Activity levels will be measured for ten minutes, with expectations of crickets in the highest concentration to be the least active, due to them being sick from exposure. Death rate will be measured, and I expect crickets exposed to the highest concentration to die at the highest rate due to the toxicity of the chemical compound. With the anticipated data, West Virginians will be offered an accurate account the toxicity of cleaning products, and will be guided to use potentially safer alternatives to sanitize their homes in the future.

17. Evolutionary Analysis of Monopyle (Gesneriaceae) from Panama

Chere Davis (VA)

Institution: Glenville State College
Field: Sciences (Biology)
Faculty Advisor: Jeremy Keene

    Monopyle Moritz ex Benth. (Gloxiniinae: Gesneriaceae) is a group of terrestrial understory or facultative epiphytic herbs distributed from Guatemala southward through northern South America. *Monopyle* is traditionally characterized by differentially swollen internodes, anisophyllous opposite leaves, campanulate flowers, osmophore and the presence of uncinate trichomes (Keene, 2013; Roalson et al. 2005; Weber, 2004). *Monopyle* Moritz ex Benth. is currently represented by six species and one variety in Central America. The largest percentage of taxa have been confirmed to reside from the premontane to montane forest in Panama and Costa Rica from 300–1300 m. *Monopyle puberula* C.V. Morton and *Monopyle maxonii* C.V. Morton have the broadest distribution in the region with other species being narrow endemics. Revisionary work on the genus has led to the identification of several newly discovered species in the region previously lumped within *Monopyle macrocarpa* Benth. A morphological and molecular assessment of species from this region have shown that *Monopyle macrocarpa* does not occur in Central America and is actually restricted to an area of Northern Peru. The newly discovered species can be determined by a suite of characters which include density of pubescence, petiole length, calyx shape, and corolla shape coupled with color. My research focuses on separating both *Monopyle dichotoma Keene ined.* and *Monopyle sessilis* Keene ined. as new species from previously known taxa.

18. Confirmation of a New Genus (*Pseudodiastema*) within Gloxiniinae

Colton Ring (Wetzel, WV)

Institution: Glenville State College
Field: Sciences (Biology)
Faculty Advisor: Jeremy Keene

    Pseudodiastema is a proposed new genus of plants being separated from the genus *Diastema* within the subtribe *Gloxiniinae* (Gesneriaceae). *Pseudodiastema* is a group of scandent herbs noted by the presence of a leaf-like bract at the base of the flower stem and 1 to 2 flowers per stem. The species are also typically more pubescent than Diastema. I am currently collecting morphological and molecular data to confirm the boundaries of the new genus. Morphological studies will focus on taxonomically useful vegetative and reproductive characteristics. Field work will be carried out in northern Panama. I will be observing the ecological and population structure of the available Panamanian species. Field studies will provide an opportunity to obtain data that is not easily observed on dried museum specimens. The outcomes of this research will provide a baseline for conservation and governmental agencies to work from to protect the habitat where these species exist. Evolutionary studies will be completed following the field study to ascertain the relationships between the species present.

19. Cloning Mutations of p53 for Expression in Tissue Culture Cells

Sydney Waugh (West Virginia)

Institution: Concord University
Field: Sciences (Biology)
Faculty Advisor: Dave Chambers

The interaction between p53 and MDM2 proteins have been studied and examined for multiple years (See "The Tumor Suppressor p53: From Structures to Drug History"). These studies have concluded that overexpression of MDM2 results in the inactivation of p53 and its' functions, thus causing the formation of tumors. The major function affected is p53's ability to induce apoptosis in states of overexpression. However, mutated p53 or p53 pathways have also been discovered to cause the creation of malignant tumors. In this research project the rate of cell death (apoptosis) will be measured and compared between wild-type p53 and mutated p53. The mutations designed and inserted into the gene will inhibit the interaction between p53 and MDM2. This research can be applied to cancer research and trying to find a reversible affect to malignant cells.

20. Differential Gene Expression Response to High-Fat Diets in Brown Adipose Tissue of Obese Mice

Kristiana Sklioutovskaya-Lopez (Mercer, WV)

Institution: University of Charleston
Field: Sciences (Biomedical)
Faculty Advisor: Dawn Turner

In the midst of the ongoing obesity epidemic, brown adipose tissue (BAT) has emerged as a potential therapeutic target. BAT is a heat-producing organ in mammals that is characterized by fat cells with numerous mitochondria. BAT uses cellular free fatty acids derived from the breakdown of triglyceride droplets to generate heat via the action of uncoupling protein 1 (*Ucp1*), located in the inner membrane of the cell's mitochondria. In this study, we analyzed mRNA and protein levels of genes involved in inflammation, mitochondrial biogenesis, and triglyceride metabolism in BAT of the TALLYHO/JngJ (TH) mouse, a polygenic model of obesity and type 2 diabetes. TH and non-obese control mice, which were C57BL/6J (B6) mice, were fed either chow or high fat (HF) diets for approximately 16 weeks. Mice were then euthanized, and their interscapular BAT was collected. mRNA and protein levels in BAT were measured using qPCR and western blot analysis, respectively. There were no significant differences in Ucp1 mRNA levels between TH and control mice on either diet. Inflammation was increased in TH mice on HF diets, as indicated by interleukin 6 (IL6) mRNA levels. Interestingly, HF diets increased triglyceride metabolism in control mice, but not in TH mice, as indicated by adipose triglyceride lipase (*ATGL*) mRNA levels. In summary, we observed different responses to HF diets for IL6 and ATGL expressions in BAT of obese vs. control mice. These results may signify increased inflammation and reduced triglyceride metabolism in BAT during the development of obesity.

21. Can Your Diet Help Cure or Prevent Lymphoma

Bradley Muncy (Mingo, WV)
Ashton Mullens (Nicholas, WV)

Institution: Marshall University
Field: Sciences (Biomedical)
Faculty Advisor: Philippe Georgel

While heredity does play a role in the onset of disease, various environmental factors influence the development and progression of cancer through changes in epigenetic regulation. One of the most significant external factors that can influence how cells operate on a genomic level is through diet; thus, making the biological effects of diet on human health a primary focus for medical studies. Recent studies have demonstrated that diets rich in omega-3 fatty acids hold the potential to impact cancer incidence and recurrence. Predicated on the finds of a prior study on Chronic Lymphocytic Leukemia (CLL), another lymphocytic cancer, Diffuse Large B-Cell Lymphoma (DLBCL), has been identified to share specific biomarkers that play an integral role in the occurrence and progression of DLBCL. These biomarkers that are characteristic to DLBCL have been monitored through analysis of omega-3 fatty acid treated and control DLBCL cell lines. Our laboratory intends to investigate how omega-3 fatty acid mediated epigenetic changes influence expression of specific genes known to be involved in the progression of DLBCL. Ultimately, our goal is to identify a specific epigenetic and expression profile that will allow us to characterize the beneficial changes in DLBCL induced by an omega-3 rich diet.

22. Reducing PLGA nanoparticle and MnO core size to enhance MRI breast cancer detection

Jasmine Grossman (West Virginia)

Institution: West Virginia University
Field: Engineering (Biomedical)
Faculty Advisor: Margaret Bennewitz

Magnetic resonance imaging (MRI) can detect more breast cancers than mammography, the current gold standard screening technique. However, MRI still produces a high false positive rate of up to 25% due to the commonly used gadolinium contrast agent, which is always active and nonspecifically highlights all vascularized tissue in the body. Poly(lactic-co-glycolic acid) (PLGA) nanoparticles containing manganese oxide (MnO) cores have been introduced as novel pH-sensitive contrast agents, and can be activated in the acidic environment of tumors to provide selective MRI contrast at the cancer site through Mn^{2+} generation. In this study, PLGA nanoparticles and MnO cores were fabricated with altered reactant constituents to minimize their diameter and improve diagnostic efficiency. Higher percentages of the polymer stabilizer, poly(vinyl alcohol) (PVA), reduced PLGA nanoparticle size to 146 ± 71.8 nm, and the combination of different reactant components and reaction temperature profiles reduced the MnO core size to 36.7 ± 22.2 nm. In another trial, Mn_3O_4 cores, which require slightly more acidic environments to produce Mn^{2+} contrast, were generated and formed an average diameter of 7.8 ± 4.7 nm. Smaller cores are expected to enhance packing volume, and the increased surface area will generate more Mn2+ in cancerous environments to strengthen MRI signal intensity. It is anticipated that smaller PLGA nanoparticles will enter tumors more efficiently and generate a faster Mn2+ release profile, resulting in improved diagnostic accuracy and earlier detection of breast cancer.

23. Understanding combustion: gas phase kinetics of the CH radical and cyclopentadiene reaction

Zachery Donnellan (Boone, West Virginia)

Institution: West Virginia University
Field: Sciences (Chemistry)
Faculty Advisor: Fabien Goulay

In complete combustion processes, the products are considered to only be carbon dioxide and water, however in practice many other compounds can be produced, lowering the energy efficiency or yield of the process and possibly leading to harmful side products. Some of these side products are polycyclic aromatic hydrocarbons (PAHs) that can further react to form soot. This study seeks to investigate the reaction rate for one of the possible reactions for benzene formation – CH radical with cyclopentadiene (c5h6) – a building block in soot formation processes. To accomplish this, laser induced fluorescence is used to measure the kinetic decay of the radical under pseudo first order kinetics at temperatures ranging from 300–450 K and pressures 2–10 Torr. From experimentation, an approximate reaction rate of $k = 2.4 \times 10^{-10} (\pm 3 \times 10^{-11})$ cm^3 s^{-1} was found with benzene being the major product – found using photoionization mass spectrometry. In the future, chemical models may be composed combining these data along with other side reactions to get a clearer picture into incomplete combustion processes. Additionally, this research could be used to develop new ways for the burning of shale oils collected in the Marcellus Shale in West Virginia.

24. Ligand Attempts and Synthesis of 2, 3, 4-tri(2-methylbutanoate) glucose

David Stone (Kanawha, WV)
Kasey Blankenship (Kanawha, WV)

Institution: West Virginia State University
Field: Sciences (Chemistry)
Faculty Advisor: Michael Fultz

The wild tomato species, *Solanum pennellii*, produce a viscous secretion through glandular trichomes that deter potential pests and one of the main components of this secretion are acylglucoses. These acylsugars consist of a triesterified monosaccharide in various forms of 2,3,4-tri-O-acylglucose esters with esterified fatty acid chains. Synthesis of these compounds is preferred because of the extensive purification required to extract these materials. The acylglucose of interest for synthesis was 2,3,4-tri(2-methylbutanoate) glucose. This synthesis followed a five-step procedure that started with the protection of the primary hydroxyl group using TBDPS-Cl (73.2 % yield). Next, the anomeric position was protected using thiophenol (37.5%) and the remaining 2, 3, and 4 positions were esterified with an acid chloride (58.2 %). The last two steps were the deprotection of the primary hydroxyl group (27.0 %) and the anomeric position (14.5 %).

25. Preparation and Characterization of a New Erlotinib Polymorph

Sarah Nickel (Wayne, West Virginia)

Institution: Marshall University
Field: Sciences (Chemistry)
Faculty Advisor: Rosalynn Quiñones

Changes in the three-dimensional spatial arrangements of pharmaceutical compounds, known as polymorphisms, can drastically change a drugs' physical characteristics and chemical interactions within the human body. Polymorphism in pharmaceuticals is one of the most important aspects in the drug development and distribution processes. When a polymorphism arises, it can cause changes in bioavailability, toxicity, and stability. Consequently, these are the reasons that make the characterization of polymorphs vastly important. In this study Erlotinib, commercially marketed as Tarceva®, is of interest as it is relatively new and not been substantially researched in order to discover new polymorphs. Erlotinib is used in the treatment of non-small cell lung and pancreatic cancers, and the discovery of any potential polymorphs could indicate the potential to enhance its treatment. Erlotinib underwent heterogeneous nucleation by using phosphonate self-assembled monolayers attached to zinc oxide tiles. In addition, sublimation and melting techniques were used in attempt to isolate single crystals of possible new polymorphs. To characterize the potential polymorphs, multiple techniques were utilized, including: infrared spectroscopy, Raman spectroscopy, powder X-ray diffraction, thermogravimetric analysis, differential scanning calorimetry, scanning electron microscope, and solid-state nuclear magnetic resonance. All of these characterizations have led to the conclusion that a new polymorphic form of Erlotinib was created.

26. Synthesis of a Binding Lignd to Detect Aqueous Metal Ions

Christopher Bias (Putnam, WV)
Jeff Thompson (Kanawha, WV)
Madison Mallory (Kanawha, WV)

Institution: West Virginia State University
Field: Business (Chemistry)
Faculty Advisor: Micheal Fultz

Aluminum pollution is a serious concern in fresh and saltwater sources. Aluminum pollution occurs when aluminum hydroxides and salts from soil and rocks are dissolved into groundwater. When these aluminum ions exceed the normal concentration in groundwater (0.4 ppm), the water becomes toxic to aquatic life. Our research focused on the 5-step synthesis of a bidentate binding ligand, a compound that binds these aqueous aluminum ions for detection via fluorescence spectroscopy. One appeal to the synthesis of this ligand is the fact that fluorescence spectroscopy is a fast, simple, and inexpensive method of detecting these ions. Because the solubility of these aluminum sources in water increases in acidic conditions, this research is especially relevant to Appalachia and its surrounding areas in which acid mine drainage and acid rain are a common occurrence.

27. Zirconium Complexes as Photosensitizers for Solar Energy Conversion

Rachel Gantzer (USA, WV)

Institution: Bethany College
Field: Sciences (Chemistry)
Faculty Advisor: Carsten Milsmann

Renewable energy is becoming more important as the supply of fossil fuels diminishes. Solar energy is the most exploitable renewable energy available. Being able to harness and use sunlight to produce electricity is essential for the environment. Photosensitizers are compounds that use the energy of sunlight to produce a chemical change in another compound. They are used in many applications such as solar cells and solar panels. Currently photosensitizers are made using precious heavy metals that are low in abundance such as ruthenium and iridium. Researchers are working toward making photosensitizers with more abundant metals like zirconium and titanium. So, the purpose of this research is to replace precious heavy metals with more abundant and cheap metals in compounds that act as photosensitizers. Zirconium based photosensitizers were synthesized giving the following compounds, $(PhPDPPh)ZrCl_2(OEt_2)$ and $(MePDPMe)ZrCl_2(OEt_2)$. The percent yield of each was calculated to be 85% and 34%, respectively. The photosensitizers were then analyzed using NMR, UV-vis, cyclic voltammetry, and emission lifetime. Ultimately the goal is to make efficient photosensitizers using earth abundant transition metals.

28. Photovoltaic Systems Using Organic Dyes and Quasi-Solid State Electrolytes

Austin Paul-Orecchio (1, West Virginia)

Institution: Bethany College
Field: Sciences (Chemistry)
Faculty Advisor: Scott Brothers

Solar efficiency is the largest limiting factor that prevents the use of organic solar cells over synthetic solar panels. Solar efficiency relates the amount of sunlight absorbed to the energy converted into electrical current. Organic solar cells are a type of photovoltaic system that show promise for a cheap and environmentally friendly source of energy by converting solar light into useable energy. Inorganic solar panels containing transitional metals or semimetals in compound form have been traditionally used, but they are expensive due to strip mining and refining of the metals and can be environmentally toxic both during use and in disposal of waste. Studies of priority include determination of the most efficient dye, electrolyte mixture, and means of prolonging the lifespan of the solar cells. A paste made of titanium dioxide (TiO_2) was spread onto the surface of the conductive glass slides. Dyes extracted from various plant groups that contain carboxylic acids and phosphonic acids were spread onto the TiO_2 paste to absorb sunlight. A quasi-solid state electrolyte was prepared to increase the flow of electrons through the cells. The counter electrode was coated with a layer of graphite to act as a catalyst, and the produced current was measured using a multimeter. The results of this research will include the production of electrical current and solar efficiencies from different dye mixtures.

29. Evaluation of Extraction Techniques for Fentanyl and Metabolites in Liver Tissue for Forensic Purposes

Avery J Field (Monongalia, WV)

Institution: West Virginia University
Field: Sciences (Forensic Science)
Faculty Advisor: Luis Arroyo

In a forensic toxicology laboratory, the analysis of biological samples is conducted with the primary goal to determine the presence or absence of drugs of abuse to help identify cause of death. One of the most important specimen for analysis is liver tissue, as the liver provides drug metabolic information that help to determine the kind of drugs that might have been used. The analytical protocol for extraction of these drugs on a complex matrix, such as liver, requires the utilization of extractions techniques like liquid-liquid extractions (LLE) or solid-phase extraction (SPE). However, the incorporation of modern extraction techniques like QuEChERS (quick, easy, cheap, effective, rugged, and safe) introduces a way to reduce typical interferences including salts, fatty materials, and other matrix components. In this study, a comprehensive assessment of the extraction capabilities of LLE, SPE, and QuEChERS was performed on liver tissues enriched with fentanyl and the two main metabolites norfentanyl and despropionyl fentanyl (4-ANPP). For all three extractions, a sample of 0.2 g liver tissue was homogenized by using a high-speed mixer mill. SPE was performed using Bond Elut Certify 130 mg/3 mL columns. LLE performed under basic (pH > 7) conditions using methyl tert-butyl ether (MTBE). The QuEChERS was performed with 0.2 g QuEChERS salts, acetonitrile, and dispersive-SPE tubes. Of the types of extractions, results were evaluated based on matrix effects, recovery, and process efficiency with QuEChERS performing superior to LLE and SPE. Overall, QuEChERS displayed an improved overall extraction compared to LLE and SPE.

30. Diverging climate-growth relationships in bottomland red maple and pin oak in the Meadow River Watershed, West Virginia

John Cline (McDowell, WV)

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

Bottomland oak swamps provide ecosystem services such as nutrient exchange and pollution entrapment and generally improve aquatic and riparian habitats. These forests are declining due to human impacts (i.e., draining and development) and little is known about the development and resiliency of these plant communities. We used dendroecological methods to examine growth dynamics in canopy-dominant pin oak (*Quercus palustris*) and co-dominant red maple (*Acer rubrum*) in a remnant forest patch on the floodplain of the Meadow River in West Virginia. I developed a 141-year (1876-2016) pin oak growth chronology using core samples extracted from 15 live trees and partial cross sections cut from 16 logs. I also developed an 85-year (1931-2016) red maple growth chronology using core samples collected from 22 live trees. Temporal trends in summer moisture-growth relationships in both species indicate a shift in optimal growth conditions beginning in the late 1970s to early 1980s. My results suggest that either increased summer moisture availability or changes in local hydrology have favored red maple growth at the expense of pin oak at the study site.

31. Determining Changes in Porosity of Mature Shales on Interaction with Fracturing Fluids

Andrew McGrady (Lincoln, WV)

Institution: West Virginia University
Field: Sciences (Geology)
Faculty Advisor: Shikha Sharma

During the hydraulic fracturing process fracking fluid which is composed of high molecular weight organic compounds (delivery gels, corrosion inhibitors, cross linkers) are injected into the target formation of organic rich source rock, which causes the rock to fracture. In these fractures, at high temperature and pressure, the fracturing fluid is allowed to interact with the rock. Previous research has shown that at high temperature and pressure the high molecular weight organics break down into lower molecular weight organic molecules (LMWOCs). After this breakdown it is possible for the smaller organics to get adsorbed on the surface of shale during the fracturing fluid-rock interaction. The purpose of this study is the use high temperature and pressure reactors to simulate the interaction environment in order to observe any changes in porosity of the shale, which could be caused by the adsorption of LMWOCs. A reduction in porosity could lead to a reduction in recovery efficiency of hydrocarbons, which is around 10-13% on average. This study is expected to provide insight into whether sorption happens during hydraulic fracturing of mature shales, and how researchers/industry can use this information in the future.

32. Ages of degradation state 3 craters near Valles Marineris revisited

Oruada Ukiwo (Kanawha, West Virginia)

Institution: West Virginia State University
Field: Sciences (Geology)
Faculty Advisor: Andrew Schedl

In Schedl et al, in review, Deglaciation/Deep-Seated-Gravitational Spreading, the Cause of ≤ 1.0 Ga Landslides in Valles Marineris, Mars (Icarus), 37 ages of degradation state 3 craters are reported. Twelve of these ages are isochron ages calculated by regressing binned areal density data of craters of different sizes (>30 m or >100 m). The rest of the ages were determined using the equation of Neukum (1983) and the areal crater density of craters ≥ 1 km in diameter. Since isochrons are regressions of craters of different sizes, it should be more accurate. I calculate isochrons for 18 craters, where previously only a Neukum age existed. Comparing the histograms of ages of the 37 craters in the previous study and the 30 isochron ages there is no significant difference. All degradation state 3 craters are older than 1.0 Ga, most of the ages are older than 2.5 Ga and there is a decrease in the frequency of meteorite impacts over time. Most significantly, most large landslides (>400 km2) in Valles Marineris cannot be explained by the degradation state 3 meteorite impacts.

33. Translating Calculus in the Physical World

Faith Hensley (USA, WV)

Institution: Marshall University
Field: Sciences (Mathematics)
Faculty Advisor: Bonita Lawrence

Many students find concepts of calculus difficult to visualize and understand, so in an effort to resolve this disconnect, we have been investigating the use of a new teaching tool, a differential analyzer, as a vehicle for translating calculus in the physical world. A differential analyzer is a mechanical computer that uses wheel and disc mechanisms connected via gears to solve differential equations. There are valuable connections between written mathematics and the differential analyzer's 3D model of mathematics which we believe may serve as a missing link in students' comprehension of fundamental mathematical concepts. Therefore, I have been learning how the differential analyzer operates in order to culminate my knowledge in a teaching initiative to benefit students' understanding of the link between integration and differentiation. I have worked directly with university level calculus students and will soon be working with local high school calculus students to demonstrate these connections through both written exercises and a live differential analyzer demonstration. The focus of this poster presentation will be similar as I will explain how a differential analyzer operates and offer a visual presentation of the way in which a differential analyzer models functions' rates of change so that viewers can see for themselves the machine's potential to positively impact West Virginia mathematics education.

34. Application of Thermal Treatment to Appalachian Hardwoods to Increase their Physical and Mechanical Properties.

Grant Tennant (Wood, West Virginia)

Institution: West Virginia University
Field: Sciences (Other Disciplines (not listed above))
Faculty Advisor: Dr. Kaushlendra Singh

Yellow-Poplar (*Liriodendron tulipifera*) is a common hardwood species of the Appalachian Forest. It is relatively fast growing, generally produces straight and tall logs, and is easily identified by its "tulip" shaped leaves. However, until this point its wood has been underutilized mainly because of its inferior physical and mechanical properties compared to other hardwoods. Therefore, this work aims to add commercial value to Yellow-Poplar hardwood for outdoor applications through controlled thermal treatment. Using a simple experimental design, several samples of Yellow-Poplar were exposed to temperatures ranging from 100-200 °C in a nitrogen atmosphere for 2 and 4 hours. Our experiments have shown that thermal treatments increase resistance to both white rot and brown rot fungi. Thermal treatments conducted for 2 hours at 100 °C exhibited a 13.7% reduction in weight loss vs. control samples inoculated with brown rot and a 17.7% reduction in weight loss vs. control for samples inoculated with white rot. Additionally, increases in compression strength varied from 5% to 12% among our treatment groups. Analysis of absorption rates show that, among samples soaked in water for 1 hour, the samples treated at 200 °C for 4 hours absorbed an average of 20% less water than control samples. Overall, the 200 °C treatment absorbed the least amount of water on average, absorbing 14% less than control. In conclusion, our experiments and analysis have consistently shown a positive correlation between simple thermal treatments and improved physical and mechanical properties as well as improved fungi resistance in yellow poplar.

35. Experimental Characterization and Modeling of the Mechanical Properties of Additively Fabricated Medical Implants

Chantz Rankin (Putnam, WV)
Nathan Weese (Kanawha, WV)

Institution: Marshall University
Field: Engineering (Other Disciplines (not listed above))
Faculty Advisor: Dr. Roozbeh (Ross) Salary

Polyjet printing (PJP), a direct-write additive manufacturing technique, has emerged as a process of choice for fabrication of a wide range of medical implants, prosthetics, organs. PJP allows for high-resolution, rapid deposition of photopolymer materials, which are cured in situ after deposition using a UV light source. Despite the advantages and host of critical applications, PJP (a multi-physics process) is inherently complex and prone to gradual changes in machine behavior as well as in the properties of deposited materials. Consequently, process optimization and characterization of the functional properties of PJ-fabricated structures would be inevitable.

The goal of this work is to fabricate defect-free anatomical structures utilizing PJP Process. In pursuit of this goal, the objectives of the work are to: (i) optimize the PJP process with consideration of a broad range of consequential factors, such as: pump speed, head temperature, layer height, print direction, and UV lamp intensity; (ii) characterize the mechanical and ultimately functional properties of PJ-printed structures, e.g., tensile strength, flexural (bend) strength, and fatigue life; (iii) forward physics-based models to explain the underlying phenomena behind material deformation as well as crack formation and propagation under stress. The outcomes of the work pave the way for robust, repeatable, and reliable fabrication of medical implants.

36. WVSU Suborbital Payload for RockSat-X 2018

Jonathan Musselwhite (Kanawha, West Virginia)
Jordan Thompson (Kanawha, West Virginia)
Jerrold Taylor (Kanawha, West Virginia)

Institution: West Virginia State University
Field: Engineering (Physics)
Faculty Advisor: Marek Krasnansky

Last year, West Virginia State University (WVSU) participated in the NASA IV&V Space Flight Design Challenge (SFDC) together with other WV universities as the West Virginia SPACE Collaboration. The purpose of the SFDC is to provide students with hands-on experience designing and building experiments to be launched into suborbital flight. The goals of WVSU's experiment were to compare the performance of four Geiger tubes, test a small Michelson Interferometer in suborbital flight, and measure flight dynamics and magnetic field strength. The radiation levels were measured with four Geiger tubes while three Si PIN photodiode particle detectors were used to determine the direction of radiation. Flight dynamics such as acceleration and rotational velocity, and magnetic fields, were measured by an Inertial Measurement Unit (IMU). All measurements were controlled by a Raspberry Pi Zero, which collected and stored the data on its microSD Card while transmitting over telemetry. The rocket was launched from Wallops Flight Facility in Virginia in August 2018.

37. Predictive Abilities of Water Chemistry Data on Microbial Respiration Rates

Emma McClelland (Preston, WV)

Institution: West Liberty University
Field: Sciences (Ecology)
Faculty Advisor: James Wood

Changes in water chemistry can affect various organisms. Microorganisms are an important example, as they serve a variety of essential ecosystem functions. When microorganisms respire, inorganic carbon is released back into the system, which is a crucial step in the carbon cycle. Anthropogenic stressors could be affecting this process. In this study, water chemistry data was collected for four parameters: specific conductance (SPC), temperature, pH, and dissolved oxygen (DO). Data was used to assess for correlation between water quality stressors and microbial respiration rates. AICc models were used to determine the most predictive models. We found SPC to be a significant predictor model of microbial respiration rates. These correlations could provide us with new ways to predict the effects of stressors on multiple aspects of aquatic ecosystems.

38. Characterizing the Piney Creek Watershed: A Baseline Study

Jeffrey Gaiser (Raleigh, WV)

Institution: West Virginia University Institute of Technology
Field: Sciences (Environmental Studies)
Faculty Advisor: Matthew Williams

In this survey, information was collected regarding the habitat condition, channel profile, and stream discharge within Beckley Sanitary Board's (BSB) municipal separate stormwater sewer system (MS4) and the Piney Creek Watershed in the vicinity of Beckley, West Virginia. In order to establish robust and sustainable volunteer monitoring in the future, BSB, West Virginia University Institute of Technology, and Piney Creek Watershed Association partnered in conducting stream habitat assessments throughout the watershed utilizing the guidelines provided by the West Virginia Department of Environmental Protection's Save Our Streams initiative. Additionally, the organizations developed standard operating procedures for calculating flow and discharge utilizing low-cost, easy-to-perform float gauging methodology. In total, 17 total sites from four named streams and four unnamed streams were assessed.

39. Autonomous Water Quality Monitor for Local Streams and Waterways

Philip Hager (Raleigh, WV)
Takoda Grove

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

Stream characterization is currently a predominantly manual operation practiced by many organizations for the purpose of analyzing waterways and quality of water. Water properties are constantly monitored as an indicator of environmental shifts, biological quality, and human impact [1]. An autonomous water monitor could eliminate the manual nature of stream characterization while simultaneously increasing the effectiveness. Autonomy replaces the current methodology of immersing probes in water manually with a constantly submerged device capable of perpetually gathering pertinent data. Historically, the most restrictive factor associated with water monitoring is cost; handheld and pre-existing automated devices are limiting due to costly sensors and implementation. The product being designed replaces commercial sondes with various analog sensors integrated into a microcontroller driven circuit. Additionally, a body mounted hydroelectric turbine and/or solar panel will take advantage of the water current flowing through the stationary device and the available solar energy creating a virtually self-sufficient device. Telecommunication capabilities will make the gathered data more accessible, different modes of which possess different ranges. The most effective design eliminates the need for on-site collection from the user but in turns, sacrifices quality of data received: e.g., radio signals provide constant transmission across a limited range whereas Short Message Services (SMS) are extremely long range single message transmissions. The solution to which will consider optimization for the user concerning convenience and ergonomics while bearing in mind environmental aspects associated with long-term implementation.

40. Using NetLogo to simulate building environments

Bimarsh Sharma (Raleigh, WV)
Thomas Carter

Institution: West Virginia University Institute of Technology
Field: Sciences (Computer Science)
Faculty Advisor: Sanish Rai

Simulating an environment of a building allows to create a model that will help to study situations such as evacuation, crowd control etc. We can use this system to study the behavior of students, teachers and other people in a university department building and analyze it. For this work, we will use NetLogo which is an open source agent-based simulation software to simulate a university department office. Agent based modeling is the methodology of creating an agent for each object/model of study and providing it with the real behaviors. Using agent-based modelling to represent human occupants allows us to represent each occupant as an agent with properties of human beings. We also need to create the actual physical environment of the building. For a university department building it might be instructor office, meeting rooms, restroom, breakrooms, library, auditorium etc. We will use NetLogo software to build the simulation environment for at least one department of our university. We want to include the real data such as dimensions of the real office and hallways. Also, the instructor agents will be provided with schedule from instructors. After that we plan to run simulation for various behaviors including day to day simulation and during peak hours such as exam week. In future, we will export the data from the model and perform data mining.

41. Mind-Reading Through EEG Data

Jesse Goodman (West Virginia)
Nolan Mull
Albert Nunez

Institution: West Virginia University
Field: Engineering (Computer Science)
Faculty Advisor: Frances Van Scoy

Electrical activity within our brains generates an electrical field. This field can be measured to detect and recognize properties of our individual brain activity. It is possible to record such activity through surgical implantation of sensors and the usage of data collected by MRI or CT scanners, or through electroencephalography (EEG). Our interest in capturing data about brain activity is applied in order to assist patients with aphasia and other forms of brain injury, helping them to communicate with care givers while developing a new form of user interface: Brain-Computer Interface (BCI). Although surgically implanted sensors and MRI scans produce a more detailed data set, EEG headsets are more economical, portable, and are noninvasive. We apply techniques from the new academic specialty of data science to train our software to recognize patterns in large data sets. In our study, we sampled a collection of 14-dimensional EEG data from a person thinking of one specific topping out of twenty different pizza toppings. Using spectral coherence, we can recognize which of 20 distinct point clouds one observation is nearest to in 14-D space, identifying which topping the person is thinking about. Building from our success, we are now exploring how to interpret the patterns. That is, what specific part of the brain is involved in thinking about pepperoni slices instead of sliced mushrooms? We aim to improve recognition systems through our unique perspective on data collection and expand technology's potential impact on nonverbal communication.

42. Enhancing the properties of polymer-silica composites for CO2 capture

Ana Monteiro (Raleigh, WV)

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

Amine functionalized silica-polymer composites were synthesized and tested for CO_2 adsorption. This is a continuation of research into improving the CO_2 adsorption capacity of composites made by incorporating silica into commercial polymeric adsorbents. Nanoporous silica was dispersed in the pores of commercially available Amberlite polymer. The high porosity of Amberlite allows for synthesizing compounds within those pores to generate polymer composites. The incorporated silica can then be synthesized with surfactant templates to generate structured pores leading to large surface area which can be functionalized for various applications, among them, CO2 adsorption from flue gas. Different synthesis methods were investigated. The main differences consisted of the time the silica functionalization occurred and the use of a surfactant. The first batch of samples was prepared by soaking the Amberlite polymer in tetraethyl orthosilicate, TEOS, and later functionalizing with (3-aminopropyl) triethoxysilane, APTES. A second batch was prepared by soaking the polymer in both TEOS and APTES at the same time. For the effect of surfactant template samples were also prepared by stirring the Amberlite polymer in TEOS and adding cetyltrimethylammonium bromide, CTAB, surfactant along with APTES. The composites obtained from the four methods presented a high incorporation of silica in the Amberlite pores, ranging from 8 to 44%. The potential of each batch for CO_2 capture from dry and moist gas streams will be presented. All synthesis methods investigated can easily be implemented for industrial application.

43. Location Aware Mesh Network for Short Range Navigation Assistance

Brett Smith (West Virginia)

Institution: West Virginia University Institute of Technology
Field: Engineering (Engineering)
Faculty Advisor: Mingyu Lu

The purpose of the location aware mesh network for short range navigation is to develop a self-sustaining mesh network capable of providing information regarding the location and speed of nearby vehicles for navigation assistance and collision avoidance in self-driving and assisted-driving vehicle systems. This network will allow vehicles to be aware of each other regardless of visual clarity or blocked sensors. This has been implemented for testing using a 5.8 GHz transceiver, GPS module and a PC running custom node management software. The nodes are managed collectively, where the data from every node is known to all other nodes on the network. Data of nodes that are not adjacent to each other are passed along adjacent nodes at a less frequent rate in order to avoid network clutter, this is due to the distance making the data less relevant.

44. Subsurface modeling and well configuration design for deep direct-use geothermal development at WVU

Victoria Irr (Ohio, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Nagasree Garapati

The Morgantown campus of West Virginia University (WVU) affords an optimal and unique combination of critical factors necessary to develop the first geothermal deep direct-use district heating and cooling (GDHC) system in the eastern United States. Temperature and flow rate were identified in the 2006 MIT Future of Geothermal Energy Report to be the two most critical factors in minimizing the cost of geothermal energy. In this work, the reservoir performance is evaluated based on achievable flow rates and production temperatures for different well configurations by performing numerical modeling using iTOUGH2/EOS1 (mainly developed for geothermal applications). A radial mesh has been created around the injection and production well bores to get a more detailed pressure profile at the well bores. Since the geothermal gradient for the site location is not confirmed, based on preliminary thermal resource assessment a range of 25-30°C/km is used, and the reservoir parameters are obtained by performing core analysis and permeability measurements. Based on these measurements, a numerical model with a fractured media has been created in order to obtain the most accurate representation of the proposed geothermal formation. Results indicate that the longevity of the reservoir decreases as the mass flow rate increases and increases as the well spacing increases. These results from numerical modelling will help in designing the optimum well configuration.

45. Rare earth extraction from fly ash

Daniel Baker (Marshall, WV)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Edward Sabolsky

Rare earth elements such as yttrium and terbium which are used in everyday electronics such as your TV or cell phone can be extracted from fly ash. Fly ash is a product from burning coal which is treated almost like a waste product being added to concrete and dry wall. The goal of our project is to develop an efficient method of removing these rare earths from the fly ash. In order to extract these metals we must first break the carbon structures inside the fly ash. This can be done by mixing the fly ash with Carbon Lampblack and microwaving the mixture to about 800-1000°C, the Carbon Lampblack is much more susceptible to microwaves which allows us to get the sample up to such a high temperature. Once the carbon structures are broken the fly ash was added to a 1 molar nitric acid at 85°C for one hour to leach the rare earths. The nitric acid solutions were then sent to the Department of Energy and processed through a mass spectrometer. Results show significant increases in rare earths from the microwave and acid leaching treatment. Furthering implications would need an economic analysis of a larger sample to test viability.

46. Fabrication of Kirigami based structures for flexible electronics applications

Muriithi-David Kem (Monongalia, GA)

Institution: West Virginia University
Field: Engineering (Engineering)
Faculty Advisor: Konstantinos Sierros

Direct ink writing allows for the low-temperature processing of soft 3D functional materials with a wide range of applications from flexible batteries to soft actuators. Direct ink writing in conjunction with kirigami (a variation of origami that includes cutting) and embedded conductive nanoparticles provides a means of low thermal budget processing of electronic devices. Additively manufactured elastomers such as polydimethylsiloxane (PDMS) can be used to provide flexibility and stretchability to such devices. The direct writing of kirigami-inspired functional PDMS structures is completed in net shape without the use of physical cuts. Instead, the "cuts" are included in the printed pattern design. The effects of composition and printing parameters are studied to determine the functionality of the final structures. Electromechanical properties of the printed structures are also characterized to elucidate the applicability to soft robotics.

47. Live Load Distribution Factors for Exterior Girder Shear in Highway Bridges

Brooke Rumbaugh (Cabell, WV)

Institution: Marshall University
Field: Engineering (Engineering)
Faculty Advisor: Gregory Michaelson

When designing highway bridges, engineers utilize a variety of methods to reduce the complexity of associated calculations. One of these methods employs the use of live load distribution factors (LLDFs) when analyzing the bridge. Specifically, instead of looking at the bridge system as a whole, these factors allow for a designer to consider girders individually by determining the maximum number of design vehicles that may act on a given girder. The purpose of this research was to utilize modern modeling techniques and studies of key parameters to assess live load distribution characteristics for the shear of an exterior girder of a highway bridge. This was done largely through the use of a modeling software called Abaqus/CAE. Using this software, multiple parameters were tested for their impact on the shear of an exterior girder. These parameters included the length of the bridge, the girder spacing, and multiple other parameters that had been considered in similar previous investigations. The results of which parameters depicted an impact and which did not, permitted the development of an extensive matrix of key parameters to be evaluated for use in the determination of the new equation. This matrix was then used to analyze a multitude of bridges to determine the mathematical relationship between the LLDF and the parameters.

48. Unmanned aerial vehicles (UAVs) for surface water grab sampling

Alex Kayuha (Putnam, WV)
Akhil Purapalli (Cabell, WV)
Vijaya (Cabell, WV)

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

Unmanned aerial vehicles (UAVs) have become popular tools in various applications in science and engineering. Especially in civil and environmental engineering fields, UAVs are well utilized. For example, engineers and scientists have employed UAVs for monitoring civil infrastructure systems, traffic, illegal environmental activities, and assessing damages after natural disasters. Water resource management can also be performed with sensor-equipped UAVs by providing aerial sensing data (e.g., high-resolution images). Recently, several research groups have reported and acknowledged the capacity of UAVs for remotely collecting water samples for water quality monitoring. Water sampling is a critical step to understand water quality and, for this reason, the United State Environmental Protection Agency (USEPA) provides standardized methods and operating procedure for collecting water samples. In this research, an innovative sampling technique with an UAV and the Standard Operating Procedure (SOP) for Surface Water Sampling were performed to monitor solid contaminants in the Ohio River. A small waterproof drone was employed for surface water grab sampling near Huntington's Combined Sewer Overflows (CSOs) in the Ohio River. Solid analysis was then performed for the collected samples by the drone and by hands following SOP. The results between two methods were presented and compared. Merits and concerns of utilizing UAVs for surface water grab sampling will also be discussed.

49. Consumption of Silver Carp (*Hypophthalmichthys molitrix*) sarcoplasmic protein on bone health

Kathryn Taylor (Kanawha, West Virginia)

Institution: West Virginia University
Field: Health Sciences (Biochemistry)
Faculty Advisor: Janet Tou

Silver carp are an invasive species that poses an environmental threat in the U.S. Recovery of water-soluble sarcoplasmic proteins (SSP) from silver carp during processing has led to interest in its development for human consumption. Due to its protein, calcium, and phosphorous content carp SSP supplementation may be beneficial to bone health. The study objective was to determine whether effect of feeding carp SSP on bone is comparable to commercially available milk protein. Growing (age 28 days) female Sprague-Dawley rats were randomly assigned (n=8 rats/group) into diet groups consisting of a standard purified rodent diet with 10% w/w protein as either carp SSP, whey, casein, or no protein. Morphometry of the femurs and total mineral content determined by ashing at 600 ºC indicated significant differences between no protein and the remaining diet groups (p=.0001). Bone strength determined by three-point bending test showed no significant differences between the diet groups (p=.165). Based on the results, carp SSP supplementation is comparable to milk protein in maintaining bone health in growing rats indicating it is safe for human consumption.

50. Oral Health Education Content Analysis of Middle and High Curriculum in West Virginia

Taylor Bunting (n-a, Delaware)
Abigail Withrow (n-a, Virginia)

Institution: West Virginia University
Field: Health Sciences (Other Disciplines (not listed above))
Faculty Advisor: Alcinda Trickett Shockey

Introduction: Currently, preventative oral health education is not included in WV state content standards for middle and high school students. Purpose: The attitude of West Virginia health educators throughout the state towards preventative oral health education and their view on presenting these topics for the state has high levels of oral disease were assessed. The hypotheses that a majority of health educators are not addressing preventative oral health in these levels because there is no State Board of Education curriculum mandate. Methods: An online survey was distributed to all 700 West Virginia 6-12th grade health educators via email. Twenty-seven multiple choice questions querying demographic information and attitude questions towards preventative oral health education was used. Results were analyzed using non-equal variable t-tests. Results: 80 respondents yielded a 11% response rate. 71% indicated oral health topics were included in their curriculum. 29% responded that it was not included with 70% reporting they had never consider implementing it. 57% were not aware that dental exams are required for these students. 28% were aware of the 7th grade requirement and 0% for 11th grade. 92% indicated they routinely visit the dentist with the majority indicating it was for regular cleanings. The significant levels were 0.05. Conclusion: Contrary to the first hypothesis, the majority are covering oral health education with tobacco information. Preventative care need is recognized as 92% indicated by their regular cleanings. Oral Health Topics not included in their curriculum indicates that they "never-considered-it" or "thought-it-was-covered" proved the second hypothesis correct.

51. Evaluation of toxicity of mild and stainless steel welding fumes on mouse macrophage cells

Aaron Stavrakis (Wood, WV)

Institution: West Virginia University
Field: Health Sciences (Biology)
Faculty Advisor: Stephen Leonard

Welding fume is a metal oxide particulate dust generated during welding using metal rods. Five million worldwide and 600,000 in the U.S. are occupationally exposed. Health effects of welding fume exposure include metal fume fever, asthma, bronchitis, and lung cancer. The goal of our study is to identify the effects of the total, soluble, and insoluble fractions of fumes generated from different types of welding rods (mild steel, and two types of stainless steel). Welding fumes were characterized using X-ray diffraction and scanning electron microscopy, which showed differences in size and chemical make-up. Cells exposed to the fume fractions were assessed for viability, membrane damage, generation of reactive oxygen species (ROS), and cytokine release to determine possible toxic effects. Results demonstrated that the total, soluble, and insoluble fractions of welding fume had differential effects on cytotoxicity. Chromium levels were a strong indicator of toxicity; the fume fractions that contained more chromium had greater effects on toxicity. Results indicate the use and development of less toxic varieties of welding fume materials may decrease occupational risks.

52. Humoral (B cell) immune system imbalance is associated with development of depressive-like phenotype

Brishti White (Monongalia, West Virginia)
Liza Grossman (Taylor, West Virginia)

Institution: West Virginia University
Field: Health Sciences (Neuroscience)
Faculty Advisor: Elizabeth Engler-Chiurazzi

Major Depressive Disorder (MDD) is the leading cause of disability worldwide, affecting 300 million people. This major contributor to the global burden of disease is especially **relevant to West Virginia, where the burden of mood disorders is markedly higher than the rest of the nation.** Demand for more effective MDD interventions has driven investigation of novel therapeutic targets, including the immune system (IS). Here, we evaluated the impact of the humoral IS on control of mood, hypothesizing that a lack of B cells would induce depressive-like behavior. Using male B6.129S2-Ighmtm1Cgn/J homozygous mice (aka muMT-/-) that lack mature B cells and have no membrane-bound IgM expression, depressive-like behavior was assessed via the forced swim and sucrose preference tests. Relative to wild type (WT) control mice, muMT-/- mice displayed an age-dependent depressive-like phenotype that could not be alleviated with typical antidepressant therapy (20 mg/kg desipramine injected i.p. 30 min prior to test) but was reversed via immune modulation (adoptive transfer of splenic CD19+ B cells). This effect was not explained by locomotor or motivational group differences. Interestingly, aged WT control mice were less depressive-like than younger counterparts, possibly due to cognitive differences. Cytokine profiles and levels of neurotransmitters thought to underlie MDD will be assessed. Taken together, these data implicate humoral IS deficiency in MDD, an observation that could contribute to the body of knowledge regarding the IS role in brain disease, inform clinical practice with a paradigm-shifting therapeutic approach, and ease the mental health burden of MDD.

53. Highlighting the Prevalence of Cardiovascular Risks Among Appalachian Children with Disabilities

Grace Nowicki (Westmoreland, PA)

Institution: West Virginia University
Field: Health Sciences (Disability Research)
Faculty Advisor: Lesley Cottrell

Cardiovascular risk factors include overweight/obesity, abnormal lipids, and hypertension. Cardiovascular risks have similar threats to children and adults as the prevalence of overweight and obesity among children has increased by 12% in the past 15 years, more than 40% of children have poor diets leading to increased triglyceride levels and possible abnormal lipids, and hypertension among children has increased by 10% although universal screening is not implemented. Universal child screening for cardiovascular risk factors has been available in West Virginia for the past 20 years through the CARDIAC Project where more than 10,000 fifth grade students are enrolled annually. The current study required secondary analyses of the CARDIAC Project from 2004-2010. All children were eligible to participate in the screening at school with parent consent. Screening Day included overview (one week prior to screening), family history form sent back to school prior to screening, height, weight, blood pressure, fasting blood draw, and Acanthosis Nicrigans (AN). Multivariate analyses of variance were used to compare the two groups (those with special needs/disabilities and those without). These efforts led to the next question, which was "What are we going to do about it?" While the CARDIAC project was established for all children, measures, procedures, and education was often limited on adaptive measurement for children in wheelchairs and such. However, the findings highlight the greater prevalence of risk for children with special health care needs/disabilities and point to the need to identify adaptive physical activity, nutrition, and other wellness intervention programs.

54. Contextual interference in speech motor learning secondary to similar phonemes

Katelyn Bond (Wood, WV)

Institution: West Virginia University
Field: Health Sciences (Other Disciplines (not listed above))
Faculty Advisor: Kimberly Meigh

Purpose: The contextual interference (CI) effect is a motor learning phenomenon where learners experience difficulty during training resulting in poor performance; however, improved performance is observed in transfer conditions. Different variables elicit a CI effect, and the purpose of this study is to investigate whether phoneme (or sound) similarity may result in a CI effect during speech motor learning. Method: The study included twenty-nine participants whose hearing and speech abilities were within the normal range. Participants were randomly assigned to one of two training sessions involving nonwords with either similar or dissimilar phonemes. Each training session included nonword repetition training with feedback, retention task where trained nonwords were repeated without feedback, and a transfer task where novel, untrained nonwords were repeated. Following the first training session, participants initiated the second training session with the opposite set of stimuli. Stimuli assignment was counterbalanced across participants. Current analyses includes perceptually rating accuracy of the nonword productions, as well as measuring acoustic durations of accurately produced nonwords. Results: Analysis is still in progress; however, preliminary analyses suggests motor learning may be influenced by the number of similar phonemes present in each nonword. This is suggestive of a CI effect due to phoneme similarity. Conclusion: Speech is a unique motor act that includes additional variables that may be used to influence the CI effect (e.g., phoneme similarity). Understanding the CI effect provides insight into the motor learning variables that influence motor performance, which may be used in speech therapy to enhance clinical outcomes.

55. Clinical Study Comparing the Effects of Stannous vs. Sodium Fluoride on Implant Surfaces

Laykin Beardsley (Wood, West Virgina)
Megan Wetzel (Cabell, West Virginia)

Institution: West Virginia University
Field: Health Sciences (Other Disciplines (not listed above))
Faculty Advisor: Alcinda Trickett Shockey

Intro: Abrasion and erosive effects of common active ingredients in dentifrices on titanium dental implants is an issue. A lack of research acknowledging what type of dentifrice is safe to use on dental implants is needed. Purpose: This study was to determine if alterations to implant surfaces due to the abrasive and erosive properties of stannous fluoride, sodium fluoride, and distilled water were present. Methods: Twenty-four titanium dental implants were utilized. They were first divided into groups of 12, and then into four groups of six. The implants were mounted in improved stone. Each implant was brushed for five seconds, twice-a-day, every day, over a four-month period. A soft-bristled electric toothbrush with a round, oscillating brush-head with designated dentifrices (stannous fluoride/sodium fluoride) or the control (distilled water) was used. Initial images were captured before conducting the study using a AmScope MU1000 (10MP USB 2.0 microscope digital camera). The implants were evaluated every month to monitor surface alterations over the course of four months using a SEM. Results: The dental implants that were brushed with the stannous fluoride dentifrice had more surface alterations present when compared to sodium fluoride and distilled water. Implants brushed with distilled water had less alterations than implants brushed with stannous fluoride or sodium fluoride. Conclusion: Contrary to our hypothesis, all three groups displayed alterations to the implant surfaces. Stannous fluoride shows the greatest alterations. All month one groups produced more alterations present when compared to month four groups. The act of brushing polishes the implant surfaces.

56. The Epigenetic Role of Septic Microparticles in Alzheimer's Disease

Mya Vannoy (Kanawha, WV)

Institution: West Virginia University
Field: Health Sciences (Immunology and Medical Micobiology)
Faculty Advisor: Duaa Dakhlallah

Sepsis is an incapacitating systemic inflammatory disease that is associated with infection etiology. Survival sepsis patients develop neuropsychiatric symptoms of memory loss, mood disorders, delirium, and long term cognitive impairment that would exacerbates brain dysfunction with unclear explained mechanism. Sepsis patients shed into the blood high numbers of microparticles retaining epigenetic regulators (miRNA, DNMTs and HDACs) from different cell-types to be up-taken by recipient cells. MPs are membrane-enclosed vesicles that a variety of cells shed into the body. Septic-MPs play an important role in cell signaling, vascular function, and inflammation. We found increase DNMTs gene expressions in multiple organs, including the brain, increase of sickness behavior, memory loss, and cognition after 7 days of sepsis initiation in Alzheimer's disease-(AD) animal model. In this project, we are studying the epigenetic role of Septic-MPs from sepsis animal model-(CLP) in AD progression in-vivo. We hypothesized that transferring CLP-MPs from septic mice to AD mice would accelerate the progression of AD. We aim to provide better understanding of septic-MPs' role in the progression of cognitive diseases.

57. Myeloid Derived Suppressor Cell Chemotactic Potential in Neonatal Sepsis

Travis Rawson (Jackson, WV)
Jordan Vance (Kanawha, WV)

Institution: West Virginia University
Field: Health Sciences (Immunology and Medical Micobiology)
Faculty Advisor: Cory Robinson

Infants are more susceptible to infectious disease due to immaturity of the developing immune system. Our laboratory has shown that expression of the immunosuppressive signaling protein, interleukin (IL)-27, is elevated in neonatal humans and mice. Myeloid-derived suppressor cells (MDSCs), that suppress T-cell functions, are more abundant in neonates. We have shown that MDSCs produce IL-27 and are a source of elevated IL-27 levels in neonates. MDSCs utilize nitric-oxide synthase (NOS2), arginase-1 (ARG1), the NADH-oxidase-complex, and IL-27 to elicit suppressive activity. To test the hypothesis that MDSCs gain enhanced immunosuppressive function during neonatal sepsis, MDSCs were isolated from neonatal mice infected with *Escherichia coli*. Infections modeled sepsis similar to humans, demonstrating reduced weight gain in infected animals compared to controls, with high levels of bacteria in blood and peripheral tissues. Gene expression analysis revealed that NOS2 and ARG1 expression was increased in MDSCs from infected mice. These same results can be replicated by infecting MDSCs with *E. coli* in culture. Additionally, functional assays demonstrate enhanced NOS2 and ARG1 activity in MDSCs exposed to *E. coli*. Our findings suggest that mitigating MDSC activity during neonatal infection may improve outcomes.

58. Generating bioluminescent Gram-negative bacteria to improve visualization of bacterial pathogenesis

Annalisa Huckaby (Monongalia, WV)

Institution: West Virginia University
Field: Health Sciences (Biology)
Faculty Advisor: Mariette Barbier

Bioluminescence is a natural phenomenon occurring in marine organisms, fireflies, fungi and in some bacteria such as *Vibrio alginolyticus*. These organisms utilize the luciferase enzyme which oxidizes flavin mononucleotide (FMNH2) and emits blue-green light. The luciferase gene (lux) was previously inserted into bacterial plasmid, pUC18-mini-Tn27-Gm, and used to study bacterial pathogenesis. However, the efficiency of the light production is dependent on the availability of FMNH2. We hypothesized that expression of flavin reductase (*frp*) will increase the availability of FMNH2 and maximize the bioluminescent production. Therefore, we created several constructs of pUC18-mini-Tn27-lux-Gm containing the *frp* gene. These plasmids were inserted in different pathogenic Gram-negative bacteria, and the luminescence was monitored overtime. We observed that the inclusion of the *frp* gene increased the luminescence of the bacteria and that the amount of bioluminescence was dependent on the promoter region of *frp*. Following in vivo experimentation, promoters of *frp* will be optimized for each bacterium. These bioluminescent constructs will be used to visualize the dissemination of bacteria through the body to improve vaccine development for antimicrobial resistant strains.

59. Maternal Exposure to Electronic Cigarettes Affects Memory and Learning of Their Offspring

Juliana O'Reilly (Berkeley, WV)
Abigail Johnson (West Virginia)

Institution: West Virginia University
Field: Health Sciences (Biomedical)
Faculty Advisor: I. Mark Olfert

Electronic cigarettes (e-cigs), also known as vaping, is marketed as a safe alternative to smoking, in some cases even during pregnancy. But the effects of vaping on offspring is unknown. We hypothesize that in utero e-cig exposure, with or without nicotine, would adversely affect the memory and learning development of offspring in rats.

Pregnant rats were exposed 5 days/week to either Air, E-cig with no nicotine (e-cig0), or e-cig with 18 mg/ml nicotine (e-cig18) starting at gestation day 2 until postnatal day 21 (when pups were weaned) using a whole-body exposure system. Male and female F1 pups (n=8-14) from each group underwent spatial memory and learning behavioral tests starting at postnatal day 25.

In Morris Water Maze (spatial memory) test, there was a reduced overnight memory in e-cig18 pups ($p<0.01$), but not in e-cig0. However longer-term memory (>4 days) was better in e-cig0 and e-cig18 pups compared to air ($p<0.05$). In the Passive Avoidance (aversive learning) testing, e-cig0 took more time to avoid averse stimuli during the learning phase ($p<0.01$), however memory retention to aversive stimuli was not different between groups. No differences in behavior for nociceptive (pain-sensing), locomotor, anxiety or willingness to explore were observed between the groups.

In summary, we found evidence that offspring experiencing in-utero exposure to vaping (with or without nicotine) demonstrated changes in learning and memory up to 1 month after birth. These findings highlight the need for future work to examine long term cognitive function and health related to e-cig use.

60. Heat Shock Protein 90 Inhibition in Kasumi-1 Leukemic Stem Cells

Matthew Rosolen (Canada, Ontario)
MacKinzie Smith (West Virginia)

Institution: University of Charleston
Field: Health Sciences (Biology)
Faculty Advisor: Vincent Sollars

Heat Shock Protein 90 (HSP90) is a well-conserved chaperone protein present in all human cell types. In cancers, HSP90 protein expression is often upregulated as a result of the cancer cell's elevated metabolic rate and accumulation of mutations resulting in protein-folding defects. Inhibition of HSP90 can be a potent anticancer strategy, and drugs that target HSP90 are currently in clinical trials. Luminespib (AUY922) is an HSP90 inhibitor that is currently undergoing clinical trials. This drug is unique in that it is one of the only HSP90 inhibitors known to target both the alpha- and beta- isoforms of the protein. Various dosages of AUY922 were administered to the Kasumi-1 acute myeloid leukemia cell line to evaluate the potency of AUY922. A Western Blot analysis was performed in three biological replicates to measure expression levels of Heat Shock Protein 70 (HSP70), a molecular partner of HSP90, that is upregulated when HSP90 is inhibited. A three-colored flow cytometry experiment was conducted with CD34, CD38 and Live/Dead label to determine the effects of increasing dosages of AUY922 on both the overall population and specifically the stem cell population, which is thought to drive relapse. We showed that HSP90 inhibition flushes the cancer stem cell population in a dose-responsive manner. This work may be important in furthering the discussion of drug development that targets the cancer stem cell population to promote durable remission and to prevent relapse.

61. Health Literacy in West Virginia Cancer Patients

Charles Simpson (Cabell, West Virginia)

Institution: Marshall University
Field: Health Sciences (Other Disciplines (not listed above))
Faculty Advisor: Sara Simpson

IRB approved prospective study of patients who consented to participate at the CAMC Cancer center. Patient demographics along with a validated survey contain three literacy questions regarding respondent's abilities in completing forms, reading clinic materials, and learning about their medical condition. Survey scores of < 8 were considered low literacy and scores > = 8 were considered adequate literacy.

Results: The study sample was 176 cancer patients which was composed of 73% females, a had a mean age was 63 (range 38-90), and 94% where Caucasian. Breast cancer (38%) and lung cancer (11%) were the predominate cancers and 66% were married. Previous chemotherapy treatment was noted in 72% of the population. Other health burdens included high blood pressure (44%), diabetes (21%), COPD (9%), Liver disease (3%), peripheral vascular disease (3%), congestive heart failure (3%). Low literacy was found in 10% of the study population and was associated with those whose income was < \$20,000 (p < .05).

Conclusion: This study found that lower incomes were associated with lower health literacy. It is important for physicians to be aware of patient's gaps in health literacy to assure patients can complete forms properly, understand clinic materials, and their medical condition, and thus be able to traverse the health care system. Further studies will be conducted to ascertain if health literacy also impacts patient outcomes.

62. The Efficacy and Toxicity of Synthetic Anti-Parasitic Drugs as Compared with Plant-Derived Treatments

Tiffany Wimmer (Mercer, WV)

Institution: Concord University
Field: Health Sciences (Biomedical)
Faculty Advisor: Thomas Ford

As a natural response to encountering similar drugs throughout the decades, parasite drug resistance is on the rise. This increase in drug resistance has not only progressed through lack of research but also through the ease of access, lack of treatment options, elongated usage, frequency used, and lack of the requirement of a prescription to obtain anti-parasitic drugs. Parasitic infections in animals can result in major decreases in productivity. Parasitism in a host can lead to direct tissue damage, loss of nutrients and energy, loss of appetite, and eventually death. Due to this plummet in productivity, farmers experience economic and financial losses as well. Not only can animal parasitism have an indirect effect on humans, but a direct impact can be introduced when zoonotic disease-causing parasites are transferred via an animal vector to a human host. Due to an increase in population size and the demand for drug-free food production, the management and control of parasitic infections is important.

In looking at the chemical defenses of plants, secondary metabolites are a promising option for parasite control. These organic plant compounds are not only environmentally safe, but strong enough to deter herbivory and predation. Through plant distillation, the secondary metabolites can be blended to form what many people know as an essential oil. The goal of this experiment was to prove the efficacy of essential oils as a primary treatment option for parasites. Based on the results of the experiment, essential oils are more efficient at treating parasites than synthetic anthelmintics.

63. The Effects of Teeth Whitening on the Enamel

Brooklyn Wilson (Fayette, Ohio)

Institution: Bethany College
Field: Health Sciences (Chemistry)
Faculty Advisor: Scott Brothers

Teeth whitening treatments will be analyzed using hydroxyapatite imitation teeth. These types of treatments include whitening toothpastes, whitening rinses, over-the-counter whitening strips, over-the-counter whitening gels, and LED tray-based teeth whiteners. Each treatment will be conducted a total of 8 times to see which will whiten the teeth the most efficiently. Small pellets that resemble the shape of a tooth will be formed using a pellet press and hydroxyapatite, which is crystalline calcium phosphate ($Ca_{10}(PO_4)_6(OH)_2(s)$). The hydroxyapatite will closely resemble the structure of the tooth enamel. A total of 40 teeth will be shaped. The different whitening treatments will be tested, and the Vitapan Classical Shade Guide will be used to compare the whitening changes. Data collection will be gathered based on the starting and ending shades of each tooth when analyzed using digital photography and an algorithm search. The LED tray-based teeth whitener is expected to show the most whitening change because it is able to eliminate both intrinsic and extrinsic stains. The whitening toothpaste is expected to show the least whitening change because it is only able to eliminate extrinsic stains with abrasives.

64. Influence of Estrogen and Age on NK3R Expression in POMC Neurons

Emily Rainey (Raleigh County, West Virginia)

Institution: Alderson Broaddus University
Field: Health Sciences (Biology)
Faculty Advisor: Stanley Hileman

Puberty onset is driven by increased gonadotropin releasing hormone (GnRH) secretion from the hypothalamus which subsequently evokes ovulation. In sheep, ovarian estradiol (E2) inhibits GnRH secretion prior to puberty, but GnRH neurons do not express estrogen receptors. Thus, other neurons must mediate the effect of E2 on GnRH release. The neural mechanisms controlling puberty in females are not completely understood, but likely involve cells in the arcuate nucleus of the hypothalamus expressing neurokinin B (NKB). NKB is critical for puberty and acts through its receptor, neurokinin 3 receptor (NK3R), to stimulate GnRH secretion. Pro-opiomelanocortin (POMC) neurons also likely play a role in puberty as these cells regulate nutritional intake, are located in the arcuate nucleus of the hypothalamus, and impact reproduction. While nutrition plays a critical role in puberty onset, the neural connection(s) linking nutrition and puberty are unknown. This study hypothesized the presence of NK3R on POMC neurons and that NK3R expression would be affected by estradiol and age. Experimental groups (n=4/group) were prepubertal ovariectomized (OVX), prepubertal OVX+E, postpubertal OVX, and postpubertal OVX+E females. Tissues were assessed for POMC neurons expressing NK3R using dual-label immunofluorescence. A high percentage (~93%) of POMC neurons exhibited NK3R-containing close contacts. However, neither age nor estradiol influenced percentages of POMC neurons contacted or number of contacts/POMC neuron. The high amount of NK3R expression by POMC neurons suggests extensive interaction. However, changes in NK3R expression in these neurons does not appear to be limiting to the potential impact of estrogen or age on such interactions.

65. Perceived Advantages to Inclusive Programming in Music Therapy

Maria Ducci (Marshall, WV)

Institution: West Virginia University
Field: Creative Arts (Music)
Faculty Advisor: Dr. Dena Register

The goal of this study is to determine trends in motivation for entering a child into an inclusive program. Dreamcatchers, the first established inclusive program facilitating the practice of Music Therapy in the state of West Virginia, was assessed to examine whether it served the purpose initially planned for the program. As a public program, Dreamcatchers was developed to create an opportunity for children with and without disabilities to socialize and develop through music therapy. There is literature to support the effectiveness of inclusive programming which targets the integration of participants with and without disabilities in the same program to give each group experience interacting with the other. Dreamcatchers was open to the public, and implemented learning through song, dance, and art. The pilot session lasted approximately eight months. Interviews were held before and after the program's completion with parents and participants. The authors transcribed the responses, and the transcriptions were compared and coded for analysis. Results suggest many guardians registered their child into the program for an opportunity to gain socialization skills. We are eager to see what other results are found through this method of data collection. The findings support the goal of the program and can be useful for the planning of inclusive programs in the future. Limitations of this study include the somewhat small data pool from which the results will be formed; therefore, repetition of this study in different locations could be beneficial for more generalized conclusions.

66. The Effects of Instructional Rubrics on Essay Quality

Erica Tracewell (Wood, WV)

Institution: West Virginia University
Field: Education (Education)
Faculty Advisor: Melissa Patchan

Rubrics are a common grading tool used by instructors that articulate expectations for an assignment by listing the criteria along with descriptions of varying levels of quality from excellent to poor. Unlike scoring rubrics, which are not usually made available to students, instructional rubrics are co-created with students and are considered to be more effective because they can help students understand assignment expectations, better focus their efforts, and ultimately increase their level of achievement. However, no empirical work has tested this belief. Therefore, the purpose of present study was to examine the effect that co-created rubrics versus instructor-provided rubrics had on the quality of essays written by students. Data was collected from 139 students enrolled in two sections of an undergraduate-level social science course. As part of this course, students were required to write a brief essay. Prior to completing the assignment, one section co-created a rubric with the researcher, and the other section was provided a rubric by their instructor. The co-created rubric and provided rubric were identical. The essays were also coded using this rubric. Students who co-created a rubric scored higher on the content dimension than students who were provided a rubric. This finding suggests that student involvement in the creation of a rubric can better support writing assignments than simply having one provided. This study could inform the way educators implement rubrics in the grading process in order to optimize students' understanding of expectations and overall learning.

67. Autism Has No Boundaries

Skylar Minzler (Ohio, West Virginia)
Karli Ray (Ohio, Wes Virginia)

Institution: West Liberty University
Field: Education (Disability Research)
Faculty Advisor: Miriam Douglas

Research has shown that current diagnostic measures for autism tend to overlook females because of the differences in how autism presents itself in females, therefore the number of individuals on the spectrum present to be significantly higher. Through research, we have found that boys are four times more likely to be diagnosed with autism than girls, which led us to question whether autism was more likely present in boys than girls or if girls were simply misdiagnosed. Autism manifests differently in girls, as girls are more likely to be social and happy children. Symptoms and characteristics aren't noticed because of the behaviors girls possess in early childhood. These behaviors mask autistic tendencies. There are also some biases surrounding girls having autism. Doctors are less likely to recognize it in girls because the symptoms display so clearly in boys and research shows that boys are more likely to have the disorder than girls. We predict that the numbers may become more even if diagnostic measures were suited for girls and boys alike.

68. The Advantages and Disadvantages of Being a Student Athlete

Jessye Sutton (Ohio, West Virginia)
Zachery Yeater (Tyler, West Virginia)

Institution: West Liberty University
Field: Education
Faculty Advisor: Miriam Douglas

Being a college student athlete comes with many advantages and disadvantages. Between studying for quizzes and tests, showing up to class, going to practice, and making meetings on time, time management plays a big role in playing college sports and being a successful student athlete. To mention just a few of the challenges: staying on top of meetings, practices, weight lifting, and having to worry about passing all of the classes successfully. Scholarships are a major positive aspect in college athletics. They support students to pay for their college while they are successful students and athletes at the same time. Scholarships give them a reason to work hard and motivate them to receive a spot. Even though it sometimes can be hard to be a student athlete, there are many advantages that were discovered and will be discussed in our research: having a team bonding and family like experience while traveling with your teammates; taking responsibility and being committed to both, your athletic and academic responsibilities; facing adversity, but overcoming it by working hard and managing your time wisely. This experience is something that shapes many athletes for their future careers and that they hold on to for a lifetime. Our research will look at the advantages and disadvantages of being a student athlete from a "lived-experience perspective" of a Football and Track scholar.

69. STEM Education through Radio Astronomy: Project-Based Learning with Small Loop Antennas

Ellie White (Cabell, West Virginia)

Institution: Marshall University
Field: Education (Astronomy)
Faculty Advisor: Melinda Backus

The Small Loop Antenna Project is a new educational initiative with the goal of increasing interest and participation in STEM fields among elementary and secondary students in West Virginia by providing engaging hands-on radio astronomy research opportunities. A loop antenna kit, full-scale curriculum, and supplementary activities and experiments have been developed as part of the Small Loop Antenna Project. The loop antenna kit itself consists of all of the materials and electronic parts necessary to construct a small-scale radio telescope which is capable of detecting solar activity by monitoring the signal strength of Navy submarine communication transmissions. In addition to allowing students to contribute to citizen science with the data they collect with these antennas, this project is an excellent teaching tool to introduce students to high-level concepts like engineering, computer science, digital signal processing, astrophysics, presentation skills, creative problem solving, and many other related skills. Small Loop Antenna kits are currently being field-tested by educators in four WV public schools, and by comparing the results of assessments administered to students at the beginning and end of the unit study, we will gain a measure of how students grow in their confidence, content mastery, and enthusiasm for STEM fields as a result of participating in this project. By engaging students' imaginations with the exciting prospect of doing real-world radio astronomy research, our goal is to help students find their passions and develop skills that will serve them well in the future in any field they choose to pursue.

70. Immigrant contribution to the evolution of history in the early 20th Century Morgantown

Brooke Hostetler (Wetzel, West Virginia)

Institution: West Virginia University
Field: Humanities (History)
Faculty Advisor: William Hal Gorby

This project investigates the collection of data on previously understudied immigrants in Ward 2 (mostly Greenmont) and Ward 6 (Sabraton) of Morgantown, West Virginia. The data collected examines information gathered on immigrants over the course of three decades: 1910, 1920, and 1930 using census data and city directories. The primary objective is to gain further knowledge of the evolving composition of Morgantown's immigrant labor force and residential patterns. This study records the following information: where immigrants came from, where they resided within respective wards, their given immigration or naturalization years, native tongue, age, occupation, and household members. To illustrate the demographic changes in the immigrant population and labor employment within each ward, said information was consistently recorded over all three decades. The data also indicates the percentage of immigrants versus native born citizens in either ward. This study also examines labor conflicts, daily social life, and religious melding between immigrant groups using microfilm of local newspapers from various times in each decade such as, The Dominion Post. While still in the exploratory stages, further investigation will show the unique diversity and role of new immigrants and how their rapid arrival in Morgantown at this time changed the city's history and culture.

71. Power and Influence Noblewomen in Early Modern Europe

Jessica Hogbin (Berkeley, WV)

Institution: West Virginia University
Field: Humanities (History)
Faculty Advisor: Matthew Vester

Isabelle de Challant, daughter of René de Challant, was a woman of significant power in the Vallée d'Aoste in the sixteenth century. When her father died in 1565, he had no legitimate male heirs, and she stood to inherit his vast properties spread across what is today Italy, France, and Switzerland. During her lifetime, she struggled to keep hold of her power and the right to pass on the title count of Challant to her children and fought against claims by her male cousins and sister that they were the rightful heirs of the Challant lands. Isabelle's case did not exist in a vacuum, though, as throughout the early modern period, many noblewomen struggled to maintain control of their inherited rights. This project analyzes the scholarly literature about how women in early modern Europe rose and fell from power and influence. Many women in similar situations of power experienced attempts to remove or diminish their power. Some were accused of being mentally ill and others were controlled by their husbands or other male family members. Despite the attacks against these women, many of them continued to demonstrate significant influence over the areas that they ruled and ultimately impacted the world in which they existed. This project will use Isabelle's correspondence and other historical records to place her in a context of late Renaissance noblewomen fighting for their political autonomy.

72. Correlations between Maternal Depression, Breast Feeding Self-efficacy, and Maternal Literacy Practices

Kenyane Simpson (Allegheny, WV)

Institution: West Virginia University
Field: Other (Other Disciplines (not listed above))
Faculty Advisor: Amy Root

Maternal depression can have a negative influence on the development of children's mental and emotional growth. This study looked at the correlations between maternal depression, breast-feeding self-efficacy, and literacy practices to determine if maternal depression is a factor to the decrease in breast-feeding practices and maternal engagement with child. Pregnant women and new mothers across West Virginia were recruited and interviews were conducted and included questionnaires about their current living situation, relationships, mental state, confidence in breast-feeding, literacy practices, and the development of their child during and after the pregnancy. The results of the data shows that maternal depression prenatally is positively related to maternal depression postnatally. Also, maternal depression has a negative effect on maternal literacy practices and breast-feeding self-efficacy. As the rate of maternal depression increased, the engagement the mother has with their child decreased. This data was previously reported and the current presentation will include additional data. Moreover, it is anticipated that additional data will be available from two urban areas (Pittsburgh, PA and Baltimore, MD); if available, this data will be included in the presentation.

73. Women Beyond Bars

Hannah Belt (Frederick, MD)

Institution: West Virginia University
Field: Social Sciences (Communications/Journalism)
Faculty Advisor: Geah Pressgrove

The United States incarcerates women at the highest rate in the world for offenses that are mostly non-violent. West Virginia (WV) and Oklahoma (OK) have some of the highest rates of women's incarceration in the nation. Not only are most offenses nonviolent, but many women also receive unfair treatment while incarcerated. Understanding the public's perception of issues regarding women's incarceration is pivotal to creating change in the justice system. This is a two-year study concerning women's incarceration in these two states. The first wave of the study assessed public opinion on women's incarceration in WV and OK, including respondents from WV and OK. Following the first wave, an advocacy communications strategy will be developed and carried out in the two states, followed by another assessment of public perception. Respondents for this wave will include WV and OK residents as well. The measures for this study are modeled after the Theory of Situational Support (McKeever, B. W., Pressgrove, G., McKeever, R., & Zheng, Y., 2016) and measure behavioral intention, attitude and communicative action. The second study will indicate whether or not the campaign created a change in public opinion. The results from this study may have implications in justice reform policies and the treatment of incarcerated women as more people in these communities become aware of these issues.

74. Partisan Outrage? Analyzing US Congressional Tweets following The Parkland Shooting

Shianne Ferrell (Tyler, West Virginia)

Institution: West Virginia University
Field: Social Sciences (Communications/Journalism)
Faculty Advisor: Nicholas Bowman

The popularity of social media is not lost on politicians and public figures, many of whom turn to popular platforms such as Twitter, to share information and dialogue with their constituents. The purpose of this project is to analyze the Twitter accounts of all members of US Congress, and their reactions to the February 14 shooting at Stoneman Douglas High School in Parkland, FL (the "Parkland Shooting"). The Parkland Shooting was the deadliest school shooting in the United States and took place during a time of increased public awareness and debate about gun control and Second Amendment rights in the US. All Congressional tweets from February 14 to February 21 (the week following the event) that referenced Parkland, gun control, or related content were collected, resulting in a total of 1,008 tweets (just under three per Congress member, higher for Florida members). Working with a team of researchers at WVU and schools in Tennessee and Florida, we are currently analyzing the tweets for correlations between the content of each tweet and the (a) political affiliation of the Congress member and (b) the amount of funding those members receive from various lobbying groups. Preliminary analysis of a small sample of tweets (10% of all Congress members; 54 total members) suggests common themes including: expressions of outrage, policy discussions, social support, critique of others, and causes of mass shootings. Ongoing coding and correlation analyses is being conducted to better understand the relationship between political affiliation and Congressional members' reactions to tragic-yet-politicized events.

75. Sex Trafficking in America

Nicholas Shower (Wood, WV)

Institution: Ohio Valley University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Beth Wade

Sex trafficking is the crime taking over America silently. Sex trafficking is a form of human trafficking which involves reproductive slavery or commercial sexual exploitation as it occurs in the United States. In the minds of most Americans, this criminal action only takes place overseas. The amount of criminal cases involving sex trafficking in the US is substantially rising, and realistically it is our own fault. Americans unintentionally support sex trafficking by the means of media. This leaves a gap open for the actual target groups, which America constantly over looks. The country has taken provisions to help prevent sex trafficking which include the Trafficking Victims Protection Act. The federal trafficking victim's protection act was the first comprehensive federal legislation against the prostitution of American children. Though the actions seem to be an issue to complete, as law enforcement has a difficult time tracking down and preventing sex trafficking. Today in America, sex trafficking has come to a new name, "the new American slavery." Unfortunately, this is happening with the minors in our country.

76. Solitary Confinement

Adam O'Hara (Wood, West Virginia)

Institution: Ohio Valley University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Beth Wade

Solitary Confinement is viewed as a cell for convicted felons who have committed a heinous crime. For inmates who are convicted with the possibility of parole should never see the inside of a solitary confinement cell because of the effects it has on the brain. Studies have shown that when one is in solitary confinement, the first 24 hours feels like they are in there for two to three days. The federal government, who allow solitary confinement, does not understand how much complete silence for long period of hours tortures your brain in ways you cannot imagine. The reason for solitary confinement was so that inmates could sit there in silence with only a Bible so that they could read their bible and repent of their sins. Over the years they started abandoning their findings because inmates started becoming insanely violent, commit suicide, and the ability to function in society diminishes each day they are inside. For inmates who have the possibility of re-entering society should not spend more than 24 hours in any form of isolated cell. On the other hand, inmates who are spending the rest of their life or are on death row should have the ability to be confined in solitary.

Funding:

77. Pregnant and Incarcerated

Tyra West (Wood County, West Virginia)

Institution: Ohio Valley University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Beth Wade

Pregnant females struggle with the potential care of their child, the correct prenatal care, and post labor necessities, pregnant incarcerated females face the same dilemmas while behind bars. The quality of care for the mother during and after labor dramatically differ for mothers who are incarcerated. Jails and penitentiaries do not serve as an ideal environment for the mother or the child. The mother is subject to harsh living conditions that are not suited for the healthy growth of a baby. Most jails and penitentiaries are not prepared or equipped with the proper means of supporting pregnant women, let alone their newborn children. The future of the child is at stake because the first few years of life are so crucial to the psychological development of the child. If the child is taken away from the mother too early, than emotional bonds necessary for psychological growth and development are not made and put children born from incarcerated women subject to difficult futures as adults. According to research, psychological problems can present themselves later on in life and cause outbursts of aggression, if not supplied with the right amount of emotional support in the first few years of life. Alternate programs should be available for pregnant women that allow them to receive better prenatal and postnatal care as well as sufficient time spent in a safe environment to allow the mothers to build an emotional bond.

Funding:

78. Examining First Responder and Police Officers' Perceptions on Administering Narcan in the Field

Kelsea Pingley (Cabell, Virginia)

Institution: Marshall University
Field: Social Sciences (Criminal Justice)
Faculty Advisor: Stephen Young

Appalachia, and West Virginia in general, has come to be known as "ground zero" for the opioid epidemic. Currently, the region holds the highest number of overdose deaths in the nation. One highly controversial way we can aid in preventing overdose deaths is by granting Law Enforcement and First Responders the use of the overdose "reversing" drug, Narcan. Narcan, also known as Naloxone, is a medication that reverses the effects of opioid usage. When added to other life-saving measures, the amount of opioid overdoses would significantly decline. However, there are many disagreements regarding the use of Narcan. In this study, we examine these arguments amongst First Responders and Law Enforcement. The purpose of this research is to discover what the opinions of those who carry/administer the drug are, and the impact they believe it will have on the drug overdose epidemic. There has been very little research conducted on this subject thus far, and we hope to present a better understanding of law enforcement and first responder's opinions on the use of the drug are, so better policies can develop to combat the drug epidemic.

79. West Virginia Voter Participation and Education

Maureen Russell (Putnam, WV)

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

West Virginia is a state composed of citizens with strong, diverse political ideologies. However, in the 2016 general election, West Virginia had the third lowest voter turnout when compared to other states. (Statista, 2016) In the 2018 general election, only 47.67% of registered voters voted in West Virginia. (Clarity Elections, 2018) This is a prime opportunity to study the potential relationship between level of education and voter participation in West Virginia. In this study, I will examine the dropout and graduation rates for high school and institutions of higher education in West Virginia and the assess the quality of civics and government education in West Virginia high schools through curriculum requirements and national assessment scores. This case study will compare West Virginia to the national average in both civic education assessment and voter participation and confirm or deny the existence of a relationship. The goal of this research is to ultimately propose a solution to raise the voter turnout rate in West Virginia.

80. Foreign Actors in the Syrian Civil War, a study by FSU's OSIX Lab

Nathan Quarantillo (Morgan, WV)
Keegan Mahoney (Jefferson, WV)
Walter Warden (Mingo, WV)

Institution: Fairmont State University
Field: Social Sciences (Political Science)
Faculty Advisor: Todd Clark

Since August 2018, student analysts at Fairmont State University's Open Source Intelligence Exchange have been examining the specific military roles played by three external actors in Syria's seven-year-old civil war: Iran, Russia and Turkey. Rigorous open-source analysis has closed significant intelligence gaps on the roles these forces have played in the conflict, particularly concerning the basing locations and timeframes for the movements of and engagements involving major air, ground and naval units from these countries. The information depicted on the poster depicting these nations' respective force dispositions in the Syrian conflict has been gleaned from research databases, social media and satellite imagery. This topic is of direct interest to active and reserve components of all branches of the U.S. military, particularly those based in West Virginia: Components of the 19th Special Forces Group (Kingwood, Kenova), the 201st Field Artillery Battalion (Fairmont) and the 167th Airlift Squadron (Martinsburg). These units may be called upon to deploy in the event the Syrian conflict escalates or leads to a broader crisis in the Middle East. West Virginia's legislature plays a crucial role in facilitating the basing for these units within the state as well as assisting in the direction of their Homeland Security-related responsibilities. It is nevertheless important to raise legislators' awareness of foreign deployment contingencies for these units.

81. Racial Prejudice on College Campuses: The Role of Intergroup Anxiety and Contact

Eva MacFarland (Harrison, West Virginia)

Institution: West Virginia University
Field: Social Sciences (Psychology)
Faculty Advisor: Natalie Shook

Despite important strides in the past few decades, racial prejudice continues to be an ongoing problem in the U.S. Two factors that influence prejudice are intergroup anxiety (i.e., tension experienced when interacting with outgroup members, such as members of other racial/ethnic groups) and intergroup contact (i.e., exposure and interaction with outgroup members). Greater intergroup anxiety is related to greater prejudice, whereas greater intergroup contact is associated with lesser prejudice. Furthermore, greater intergroup anxiety is associated with less intergroup contact. Potentially, individuals who are more anxious about interacting with people of a different race avoid such experiences, which results in more prejudice. The present study evaluated the extent to which intergroup contact explains the relation between intergroup anxiety and prejudice. White college freshmen (N = 239) at West Virginia University (WVU) completed surveys assessing intergroup anxiety, intergroup contact at WVU, and prejudice toward African Americans, Hispanics/Latinos, and Asians at the beginning and end of the fall semester. Greater intergroup anxiety at the beginning of the semester was related to less intergroup contact and less prejudice at the end of the semester. Importantly, intergroup contact exclusively explained the relation between intergroup anxiety and prejudice towards African Americans, Hispanics/Latinos, and Asians. That is, greater intergroup anxiety predicted less intergroup contact at WVU, which in turn was associated with greater prejudice. Individuals with greater intergroup anxiety may avoid intergroup contact, further limiting engagement with racial minorities and contributing to prejudice. This highlights the importance of facilitative programming within communities, including college campuses.

82. The Effect of Mentorship on Women's Self-Efficacy

Amal Khan (Putnam, WV)

Institution: West Virginia University
Field: Social Sciences (Psychology)
Faculty Advisor: Paul Hernandez

In today's advancing society, careers in science, technology, engineering, and mathematics could not be more important. With the rapid development of new technology and scientific techniques, it is of great importance that the scientific community reflects our diverse society. By having diversity in science, there will also be diversity of thought, which can lead to important new scientific findings. The current study examines how women respond when assigned a mentor in their desired STEM field. Female college freshmen were given the opportunity to work with a professional in fields such as geoscience and chemistry and participated in a professional development workshop. This group was compared and matched with a control group. It was hypothesized that mentorship will be positively correlated with levels of self-efficacy. A correlational analysis found that there was a small, positive, and statistically significant correlation between combined mentor psychosocial support and instrumental support and self-efficacy, $r(93) = 0.21$, $p = .04$. The findings show that when college freshmen and sophomores are given a mentor from the start of their undergraduate studies, they develop a stronger sense of belonging to the field, as compared to women who do not have a mentor. This can lead to higher levels of motivation and self-efficacy and increases the likelihood that they will pursue a future career in the field. By involving more women in STEM fields, new approaches and scientific discoveries could be made possible.

83. Race, Female Gender Presentation, & Sexism

Sydney Hughes (Raleigh, West Virginia)

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

This study will examine how race and femininity, or the lack thereof, influence sexism. Women who do not adhere to stereotypical gender norms find that they will be viewed as less likeable (Casad & Lee, 2014). Hence, women are unlikely to deviate from prescribed forms of femininity. Race can compound the above effects; Black women are more likely to be perceived as masculine regardless of their intentional presentation (Stevens-Watkins, Perry, Pullen, Jewel, & Oser, 2014). This suggests that Black women need to perform femininity to an even higher degree than White women in order to be perceived as equal by their peers, and to gain the same benefits that performative femininity affords (Cooley, Winslow, Vojt, Shein, & Ho, 2018). In my study, participants will complete a brief demographic questionnaire, and will be randomly assigned to view a series of photos in one of six conditions that combine race of confederate with one of three female presentation styles. The presentation styles selected are feminine, masculine, and gender neutral. The photos show women in business attire, corresponding to the type of presentation condition. After viewing the photos, participants will complete a Likert-type survey with a scale ranging from one to seven on sexism. I expect White feminine women will experience the least amounts of sexism, while Black masculine women will experience the most. The findings are of relevance to West Virginia as Black women are rare and subject to greater stereotyping. They further suggest the need to identify effective intervention strategies.

84. Racism and the Freedom of Speech Defense

Anusha Sheikh (WV)

Institution: University of Charleston
Field: Social Sciences (Psychology)
Faculty Advisor: Martha Spiker

Since freedom of speech has an open interpretation in the United States, some may use it as a defense with the wrong intentions. Prejudiced individuals may exploit the freedom of speech defense to preserve their own views. A recent study (White & Crandall, 2017) indicated that people will do just about anything to defend their preexisting racist attitudes. In my study, participants will be pretested on their political orientation and racial values. Subsequently, they will view either a racist speech or a neutral speech of the same length. The posttest is expected to reveal that the people with highly observed racist views will likely be the people upholding the freedom of speech defense. The participants with less racist views should hold little to no support for the freedom of speech defense. Hence, the argument in favor for free speech is not prejudiced, rather upholding high racist views is one of the attitudes that may develop into people deciding to make an argument for free speech. With West Virginia being one of the least ethnically diverse states in the nation, it is significant to recognize and build awareness regarding racism within the region.

85. Decision-Making: a Psychological and Sociological Process

Christian Weir (Jefferson, West Virginia)

Institution: Shepherd University
Field: Social Sciences (Psychology)
Faculty Advisor: Larry Daily

The purpose of this study is to gain a better understanding of how psychological and sociological influences, such as gender ideologies and group interactions, affect decision-making outcomes. Previous research by Sczensy in 2003 suggests that, on an individual level, males are more task-oriented where females are more socially oriented. For this reason, it is hypothesized that male-dominated groups will complete a deserted island task significantly faster than female-dominated and neutral groups. Similarly, it is also hypothesized that female-dominated groups will perform the slowest of the three groups due to sociological influence causing delays in negotiation. The participants in this study include Shepherd University students from the PSYC 101 class during the fall of 2018. Using Shepherd University's Psychology Lab, participants will be presented a scenario and be asked to meet goals in relation to a themed task. The time for each goal to be completed will be recorded for each group and compared between the other conditions. This analysis will be done using a one-way ANOVA. A qualitative analysis will be used to find prominent themes in group interactions and interview questions. Completion of data collection is scheduled for November 16, 2018. Results of this research can be applied to gender relations, early education and large social problems such as the gender pay gap. In addition, this research will provide a better understanding of gender ideologies and how they influence behavior.

86. Comparison of Light Therapy vs. Peppermint Scent Administration on Mood

Margaret Childers (Ohio, WV)
Karly Judy
Caryce McGurn

Institution: Wheeling Jesuit University
Field: Sciences (Psychology)
Faculty Advisor: Bryan Raudenbush

Previous research indicates peppermint scent administration can facilitate a more positive mood and that light therapy can be effective in improving depression and depression-like symptoms. The present study was designed to assess the effectiveness of peppermint scent administration and light therapy, both individually and synergistically, in improving mood and depressive symptoms. Forty participants were exposed to each of four conditions: 1) light therapy, 2) peppermint scent administration, 3) a combination of light therapy and peppermint scent administration, and 4) a non-light, non-scent control condition. Each condition lasted for 30 minutes. After obtaining pre-experimental baselines and exposure to each condition, participants completed the Profile of Mood States (POMS) and Beck Depression Inventory. The combination of both light therapy and peppermint scent administration was associated with the lowest score for anger, confusion, depression, fatigue and tension on the POMS. Individually, the peppermint scent administration condition had the second lowest score in those categories, followed by the light therapy condition, followed by the control condition. The combination of light therapy and peppermint scent administration was associated with the lowest score on the Beck Depression Inventory, $F(4,148)=2.80$, $p=.03$. The highest vigor score was observed in the light therapy and peppermint scent administration condition, followed by the peppermint scent administration condition, followed by the light therapy condition, followed by the control condition, $F(3,117)=2.88$, $p=.04$. Such results are important as a potential non-pharmacological adjunct to therapeutic treatment of depression and seasonal affective disorder.

87. Effects of Chewing Gum on Cognitive Performance

Emily Davis (Mercer, WV)

Institution: Concord University
Field: Sciences (Psychology)
Faculty Advisor: Dr. Rodney Klein

Chewing gum can have profound benefits that range from an increase in alertness, positive changes in cognitive performance, increased concentration, and improvement of short-term and long-term memory. It seems that chewing gum can be an effective means of improving scores on demanding cognitive tests. Its been reported that those who chewed gum showed improvements in their working memory, their episodic memory, and in their perceptual speed of processing compared to those who did not chew gum. By examining data in controlled studies,' we can determine whether chewing gum can enhance test performance and look at the reasoning of how or why an individual receives these enhanced cognitive abilities. Previous research theories suggested within the paper are, the arousal theory, the effects having lowered or higher cortisol levels, the theory of the indirect effect of insulin release or changes in brain blood flow brought about by mastication.

88. Belief in a Higher Power and Death Anxiety Utilizing Terror Management Theory

Samantha Adams (Raleigh, WV)
Samantha Stanley (WV)

Institution: West Virginia University Institute of Technology
Field: Social Sciences (Psychology)
Faculty Advisor: Cynthia Hall

Belief in a Higher Power and Death Anxiety Utilizing Terror Management Theory. The study, done through West Virginia University Institute of Technology, focused on students of the university as well as members of the community and aimed to determine how their belief in a higher power correlated with their reported anxiety of death. While previous research has focused solely on the Abrahamic (i.e. Judaism, Christianity, Islam) religions and populations such as those with terminal illnesses and the elderly, the current study evaluated a broad spectrum of religions for participants of all backgrounds to self-identify as. It is the initial hypothesis that those who identify as Agnostic will also report a greater fear of death than those who self-identify with any religion. This research was done in tangent with a study done by a separate group of researchers on the correlational relationship of religiosity and depression. There was found to be an initial race effect, however this is believed to be largely due to the fact that the location of the school itself (rural Appalachia) attracts a large Caucasian population. This study is currently in the process of gathering data and intends to be completed by December 2018.

89. Differing Views on Responsibility of Addiction in West Virginia

Katelyn McCormick (Kanawha, West Virginia)

Institution: Marshall University
Field: Social Sciences (Sociology/Social Work)
Faculty Advisor: Vincent Smith

Popular opinion places the responsibility of current issues (such as: gun control, equal pay for women and minorities, equal education, and air and water quality) within various structures of society but seems to place addiction issues under the responsibility of the individual and relates it to poverty.

A survey was developed as an attempt to examine the attributions of societal challenges and addiction. What are major factors that predict how someone views addiction? Do we attribute addiction as a societal issue as we do equal pay, women's reproductive rights, and gun control or do we see it as more of an individual issue? Results of this research identify how addiction is viewed and could contribute to new ways of addressing the crisis.

90. The Impact of Implied Racial Identities and Criminal Records on Employment

Alyssa Harnish (Lewisburg, West Virginia)

Institution: Concord University
Field: Social Sciences (Sociology/Social Work)
Faculty Advisor: Rodney Klein

The United States has the largest prison population in the world with approximately 20 million felons and approximately 7 million people under the supervision of the criminal justice system, either in prison, jail, on parole, or on probation, (Bureau of Statistics, 2014). In Employment Audit studies where matched pairs of white and black applicants applied for the same positions whites were consistently favored over black applicants, and even white applicants who had a criminal record still fared better than black applicants without a criminal record (Pager, 2004). An experimental design was used to determine if college students consider race and felony status when sorting prospective job applications. Freshmen and seniors were tested and their scores compared for bias. The freshmen displayed a bias against the names only when they were paired with a felony. The felony applicants with stereotypically white sounding names were significantly more likely to be chosen for the job positions than the felony applicants with the stereotypically black sounding names. There was only a slight bias by the seniors against the names with felony status.

91. Using Computer Graphics to Create Retro Aesthetic Nostalgia in Video Games

Peyton Seabolt (Kanawha, West Virginia)
Allan Balunovic (Kanawha, West Virginia)

Institution: West Virginia University Institute of Technology
Field: Technology (Computer Science)
Faculty Advisor: Sanish Rai

To most people who enjoy video games as a source of entertainment, visual appeal is a very important factor when it comes to the quality of the game. Visual appeal in video games are facilitated by top-tier graphics that look very realistic or life like. Computer graphics require high computational resources and needs to use the processing power of central or graphics processing units (GPUs). In this research, we plan to show that top-tier graphics are not required in a video game, and graphics can be used in other ways, not just by making the visuals look realistic. Retro Aesthetic Nostalgia (RAN) is our genre of video game that appeals to players by using a more dated graphics system akin to a game called DOOM that was released in 1993, while using a modern development platform, such as Unity, that allows for the use of advanced memory management, evolved code structure for stronger programming, and ease of access in terms of world-building and accessing game-objects within our various structures. Combined, this creates a form of entertainment that appeals to consumers by incorporating systems from modern games, but also appealing to an older category of consumers by giving a retro and aesthetic feeling of nostalgia. In this work, we plan to use Unity to create a RAN based game which will run on a range of systems from a computer with basic graphics, to a high end with advanced graphical processing units without any compromise in the visual or game quality.

92. Mitigating Energy Depletion Attack in the Internet of Things

Bryan Groves (Cabell, WV)

Institution: Marshall University
Field: Technology (Computer Science)
Faculty Advisor: Cong Pu

A rapidly growing pervasiveness and ubiquity of small and cheap computing devices endowed with sensing and communicating capabilities is leading the emergence of Internet-of-Things (IoT), and paving the way to the realization of IoT applications. As a major building block of emerging IoT, low power and lossy networks (LLNs) comprised largely of resource-constrained nodes with limited computation, memory and energy are playing an indispensable role in creating an ubiquitous computing and communication environment. However, due to the shared wireless medium, and the lack of resource, physical protection and security requirements of network protocol, RPL-based LLNs are vulnerable to various Denial-of-Service attacks. Thus, in order to provide secure and reliable communication in the realm of IoT, it is essential to investigate the operation vulnerabilities of existing protocol and propose the corresponding countermeasures to potential attacks. In this project, we investigate an energy depletion attack and propose its countermeasure in RPL-based LLNs. The core scientific contributions of this research effort will be a deeper understanding of routing protocol in low power and lossy networks in the context of IoT. We focus on underlying features of routing protocol in low power and lossy networks and practical obstacles and potential vulnerabilities important to the designing of attack-resilient communication protocols for resources-constrained devices in the IoT. The proposed research will also have important implications for other proposed routing protocols in similar environments, and will provide design considerations to the broader IoT community seeking new research directions.

93. Automated IP Reputation Analyzer

Geanina Tambaliuc (Cabell, West Virginia)
Jared Lewis (Cabell, West Virginia)

Institution: Marshall University
Field: Technology (Computer Science)
Faculty Advisor: Wook-Sung Yoo

As Internet usage is increasing worldwide, today's network of the organization is challenged with numerous cyber-attack. An effective way to prevent users from cyber-attack is to identify and create blocklists (blacklists) of those harmful domains. However, there are several issues related to blocklists and dynamic blocklists approach: some authorized domains can mistakenly be added to blocklists, and some blocklist databases are not regularly maintained or updated. To solve these issues, we developed the Automated IP Reputation Analyzer (AIPRA), a cross-checking system which automatically analyzes a number of reliable blocklist databases and assigns a weighted security degree of domains and IP addresses to inform users and applications about possibilities of malicious activities. The system was developed using PHP/MySQL with API connections to retrieve information from the public databases. A report is generated for the user using JSON. Experimental field testing was conducted and its result is analyzed and discussed.

94. Deployable Remote Online Network Evaluator(DRONE)

Anh Nguyen (Cabell, WV)
Jacob Finton (Cabell, WV)

Institution: Marshall University
Field: Technology (Computer Science)
Faculty Advisor: Paulus Wahjudi

There are currently over 17 billion connected devices in the world. All of which share an immense amount of data. However, the more information we share digitally increases the risk that it will be compromised by cyber criminals. Since our government possesses a significant amount of citizens' sensitive information such as Social Security information, medical records, and even employment history, it has become the most valuable target for cyber-criminals. Although the federal government is aware of the high-risk circumstances, most state and local governments are not fully prepared to protect their critical digital systems. Since not every county in a state can afford its own cybersecurity team, when a cyberattack is present, cybersecurity technicians from a different location must be sent to help resolve the problem, which may take several hours and cause severe damages. Therefore, to shorten the reaction time, we developed a deployable remote online network evaluator (DRONE) device, which can be quickly deployed on demand to troubleshoot networks remotely. The device must be easy to setup and requires minimum maintenance. Upon request, the county's Information Technology technician could just plug the device into the network. From there, the cyber team would be able to access the compromised network and resolve the problems via the device. The device is more cost-effective than hiring a cybersecurity professional in each county. This will provide an adequate solution for the underfunded cybersecurity problem in many states.

95. Iron Falcon - Mission to Hack Space

James Shafer (Kanawha, West Virginia)

Institution: Fairmont State University
Field: Technology (Other)
Faculty Advisor: Marcus Fisher

Cybersecurity has been a major challenge across industry and government with no end in sight. The challenges are numerous, from the ever-changing threat landscape to not having a qualified workforce to combat the changing landscape. Some organizations are taking their own initiative to combat these challenges by developing internal training programs in cyber security. But these solutions do not remedy the need to educate and train the next generation of individuals that will fill the work force gaps. Unfortunately when we wait to educate the student at the collegiate level it is sometimes too late as the basic concepts and principles need to be introduced long before the student even enters a University. Given that the majority of public schools do not offer cyber security as a course you will see organizations establishing extra-curricular activities in cybersecurity in order to inspire students as well as introduce the needed concepts and principles. Accordingly, we have created a year-long project to help our students learn about space systems and cybersecurity.

Fairmont State University has teamed with WV Space Grant Consortium, WVU Amateur Radio Club, Virginia Space Institute and Twiggs Space Labs to help remedy these challenges. We have established a year-long project called "The Iron Falcon" that intends to teach students space systems engineering and cybersecurity. A student team from Morgantown High School (MHS) and University High School (UHS) will build a small spacecraft (called ThinSat) that will launch and fly in space in the summer of 2019. In parallel, student teams from across the state of West Virginia (WV) will build ground stations that can communicate with the ThinSat once it is in orbit around Earth. Once the ThinSat is in orbit there will be a state-wide competition among the ground station teams to try and hack into the Earth orbiting ThinSat.

During this academic year, participating student teams learn programming, electronics, radio communications, space systems, and cybersecurity. They receive support and guidance from Fairmont State University and WVU Amateur Radio Club. As they learn these topics the teams will be assembling a ground station that can communicate with spacecraft over amateur radio bands. The teams will have multiple opportunities to test their system and skills prior to the competition. Student teams are encouraged to established research questions such as new cybersecurity defense mechanisms over radio communications to support their ground station efforts.

Funding:

96. Security Operations Center: To Prevent, Detect, Assess, and Respond to Cybersecurity Threats and Incidents

Reno Cutright (Upshur, WV)

Institution: Fairmont State University
Field: Technology (Other)
Faculty Advisor: Marcus Fisher

With digital threats becoming more and more prevalent in today's society, the need to mitigate threats and protect one's privacy is greater than ever. It is no secret that cyber-attacks are becoming more meticulous and harder to detect. With this understanding, preventative measures need to be taken. Therefore, an Information Technology solution that can rapidly detect threats, minimize loss, and stop vulnerabilities needs to be implemented. This solution comes in the form of a Security Operations Center (SOC). A SOC in its simplest form consists of a team that can monitor internet traffic for an organization and prevent people on the outside from attacking your network on the inside. Recently, several WV towns have been getting hit with cyber-attacks that indefinitely block their computer systems unless a ransom is paid, called ransomware. The total bill for paying out ransomware is climbing quickly but can be significantly if not completely diminished by funding a project to build a SOC at Fairmont State University. This SOC would serve as a central location for managing and protecting all state-owned institutions. This SOC would also encompass the ability to service any town willing to pay a fee for services rendered. During my time in the undergraduate research class, I have drafted a high-level design of what a SOC's physical infrastructure would look like and the best practices for implementing one. With support from the state, I hope to soon start protecting the Wild and Wonderful West Virginia that I call home from cyber-attacks.

97. Profiles of T helper 1 and T helper 2 Cytokines in the Genital Tract of a Stress Mouse Model during Chlamydia muridarum Infection.

Gezelle Brown (Mercer County, WV)

Institution: Bluefield State College
Field: Sciences (Biomedical)
Faculty Advisor: Tesfaye Belay

Cold-induced stress is known to influence the dynamics of cytokine production during chlamydia genital tract infection, but the balance between Th1 and Th2 cytokines of CD4+ T cells or CD+8 T cells in stressed and chlamydia-infected mice is unknown. We hypothesized that cold-induced stress results in elevated gene expression and production of IL-4 but decreased production of interferon gamma by CD4+ T cells or increased production by TNF-□ by CD8+ T cells. CD4+ or CD8+ T cells for *in vivo* proliferation and RNA isolation were purified from total T cells of the genital using magnet CD4+ T cell enrichment protocol. Quantitative PCR and ELISA methods were used to determine gene expression in T cells and production of cytokines in culture supernatants of T cells. Culture supernatants of stressed mice showed a decreased IFN-□ and increased IL-4 productions. Furthermore, elevated and reduced gene expression of GATA-3 and T-bet transcription factors respectively was obtained in CD4+ and CD8+ T cells of stressed mice. Increased production of TNF-□ in CD8+ T cells of stressed and infected mice was obtained during proliferation. Low production of Th1-specific cytokine, IFN-□ and high Th2-specific cytokine, IL-4 reflects the correlation between the expression of T-bet and GATA-3 in stressed mice. The results suggest that stress promotes a Th2 dominance over Th1 by the overexpression of GATA-3 and a less expression of T-bet. Furthermore, increased gene expression and production of proinflammatory of TNF-α by CD8 + may a promote pathology during stress and chlamydia infection in mice.

98. Influence of Cold-induced Stress on the role of Dendritic Cells in a Mouse Model during Chlamydia muridarum Genital Infection.

Raenel Crenshaw (Mercer County, WV)

Institution: Bluefield State College
Field: Sciences (Biomedical)
Faculty Advisor: Tesfaye Belay

Chlamydia genital infection caused by *Chlamydia trachomatis* is the most common bacterial STD worldwide. Cold-induced stress inhibits the activity of immune cells during chlamydia genital infection in mice but the mechanism(s) is/are not well understood. This study was to determine how cold-induced stress affects the gene expression and cytokine production of splenic dendritic cells (DCs) in a mouse model. We hypothesized that cold-induced stress modulates the gene expression and production of cytokines during *Chlamydia muridarum* genital infection. Dendritic cells were purified from mouse spleen using a magnet DC enrichment protocol for use in proliferation and RNA isolation. PCR and ELISA were used to determine gene expression and production of cytokines in DCs following in vivo stimulation with LPS. After 96 h of culturing, culture supernatant of splenic DCs from stressed and infected mice showed a marked increase of IL-4 production (191.9 pg/ml) compared to that of non-stressed and infected mice (4.9 pg/ml). Furthermore, up-regulated gene expression of IL-4 in DCs of stressed and infected mice was observed. In contrast, a decreased production of IL-12 in culture supernatant of DCs of stressed-infected mice (46.25 pg/ml) compared to that of non-stressed and infected mice (165.9pg/ml) was obtained. Strong correlation of real time PCR and ELISA results in profiles of IL-4 and IL-12 production was obtained. Our results demonstrate that cold-induced stress influences the gene expression and production of cytokines in DCs of the spleen stimulated by LPS that may influence the DC function in the initiation and differentiation of T helper subsets