

PARTICIPANTS IN ALPHABETICAL ORDER	#
Abdullah, James	1
Abruzzino, Brittany	2
Aguilera, Ellen	3
Aliff, Hunter	11
Arnold, Elizabeth	4
Baker, Seth	5
Baker, Kathleen	6
Ballard, Haylie	7
Bell, Spencer	8
Bennett, Ciara	9
Bias, Candace	10
Bickham, Erica	11
Bovard, Kaylah	12
Brown, Rebecca	13
Bukeirat, Mimi	14
Campbell, Kristen	15
Canfield, Samuel	16
Cavender, Hannah	44
Chirpas, Lee	17
Clegg, Aric	18
Clipp, Hannah	19
Cogar, Samuel	20
Collins, Evan	21
Cottrill, Mariah	22
Cousin, Sebastian	23
Craft, Sarah	24
Cunningham, Virginia	25
Currence, Tyson	26
Cyrus, Brittany	27
Daniel, Victoria	28
Davari, Denna	29
Davis, Daniel	30
Doss, Christopher	31
Dudding, Bridgett	32
Duffy, Allen	33
Durham, Tyler	6
Eberhart, Gina	88
Elza, Michael	34
Engo, Katherine	35
Fankhanel, Erin	36
Farley, Stacy	37
Fetter, Kelby	38
Floyd, Brett	39
Fooce, Stacy	40

Ford, Matthew	41
Fugett, James	42
Galloway, Julia	87
Gray, Miles	43
Grenn, Taylor	71
Guetzloff, Megan	44
Guzide, Osman	83
Hagedorn, Rebecca	45
Hall, Corey	39
Hand, Jacquelyn	58
Harper, Scott	46
Harshbarger, Eric	6
Hefner, Catherine	47
Heitz, Devin	48
Holland, Aaron	49
Johnson, Tavon	50
Jones, Quinn	51
Jordan, Shawn	94
Kadiyala, Anand	102
Kirk, Philip	61
Knowlton, Samantha	10
Kron, Kathleen	67
Lateef, Sundus	52
Ledesma, Brandy	53
Leon, Camille	18
Lovejoy, Jordan	98
Lukich, Daniel	54
Lynn, Josh	16
Macdonald, Robert	55
Maloney, Andrew	56
Marple, Amanda	57
Mastrantoni, Kristen	58
	59
Mazagri, Hajer McClead, Wyatt	12
McCorkle, Nasiyra	60
McCoy, Marjorie	61
McLaughlin, Kayla	62
McMann, Natasha	63
Merson, Matthew	64
Mezan, Ryan	65
Milam, Olivia	66
Moats, Tuesday	67
Montgomery, Joshua	100
Moore, Ashley	68
Moore, Brandon	105
Muhly-Alexander, Dillion	57

Mullens, Cody	69
Newman, Christopher	70
Nolan, Richard	71
O'Dell, Jordan	72
Ohi, Nicholas	73
Pandelios, Alexis	74
Paris, Derrick	75
Peal, Emily	76
Perry, Alex	50
Price, Taylor	102
Ramezan, Emily	77
Ransbottom, Sam	78
Rector, Emily	79
Reynolds, Michaela	80
Rhodes, Jonathan	81
Roberts, Elijah	82
Robinson, Emily	13
Rogers, William	97
Rudgers, Jennifer	16
Ruvalcaba, Jesus	83
Sandecky, Nicole	84
Sandecky, Luke	85
Sardone, Amy	86
Sarmiento, Jacob	87
Schmitt, Deanna	41
Schultz, Justine	88
Searls, Noah	89
Shafer, Kristen	90
Simmons, Brian	91
Simpkins, James	14
Slater, Tabatha	92
Smith, Randy	93
Somerville, Aedan	94
Sullivan, Stephen	95
Taj, Scott	96
Thomas III, Jerry	70
Tolley, Evan	105
Torres, Raul	23
Tucker, Jonathan	97
Vandevender, Emily	98
Verbiest, Joris	63
Wade, Katherine	99
Wang, Lei	58
Watson, Dylon	100
Webb, Margery	98
Weiger, Katelyn	101
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Wieland, Melanie	102
Yanev, Andrey	103
Yost, John	104
Zheng, Peng	37

# PARTICIPANTS BY HOUSE DISTRICT

House #	Participant	Number
01	Spencer Bell	8
	Matthew Ford	41
	Ryan Mezan	65
	Kristen Mastrantoni	58
	Cody Mullens	69
	Richard Nolan	71
02	Randy Smith	93
	Hajer Mazagri	59
	Elijah Roberts	82
	Virginia Cunningham	25
03	Scott Taj	96
	Kayla McLaughlin	62
	Sam Ransbottom	78
04	Samuel Cogar	20
	Derrick Paris	75
07	Mariah Cottrill	22
80	Allen Duffy	33
09	Brett Floyd	39
	Candace Bias	10
10	Aric Clegg	18
11	Scott Harper	46
12	Jonathan Rhodes	81
	Nicole Sadecky	84
	Luke Sadecky	85
13	Emily Rector	79
	Victoria Daniel	28
	Christopher Newman	70
14	Noah Searls	89
	John Yost	104
	Bridgett Dudding	32
16	Olivia Milam	66
	Katelyn Weiger	101
	Jesus Ruvalcaba	83
17	Seth Baker	5
	Aaron Holland	49
	Aedan Somerville	94

	Michaela Reynolds	80
	Alexis Pandelios	74
	Lee Chirpas	17
20	James Fugett	42
22	Erin Fankhanel	36
27	Katherine Engo	35
29	Stacy Farley	37
2)	Marjorie McCoy	61
32	Matthew Merson	64
32	Katherine Wade	99
33	Emily Ramezan	77
34	Elizabeth Arnold	4
35	Tabatha Slater	92
33	Emily Peal	76
	Erica Bickham	11
36	Ciara Bennett	9
30	Ashley Moore	68
	Jordan O'Dell	72
	Denna Davari	72 29
37	Haylie Ballard	7
37		27
20	Brittany Cyrus	
38	Andrey Yanev Dylon Watson	103 100
	The state of the s	44
39	Megan Guetzloff	60
40	Nasiyra McCorkle Daniel Davis	30
42	Kristen Shafer	90
42		98
12	Emily Vandevender	96 47
43	Catherine Hefner	
	Natasha McMann	63
	Tyson Currence	26
	Michael Elza	34
47	Samuel Canfield	16
47	Kelby Fetter	38
48	Devin Heitz	48
F1	Sundus Lateef	52
51	Robert MacDonald	55
	Andrew Maloney	56
	Amy Sardone	86
	Brittany Abruzzino	2
	Nicholas Ohi	73
	Kathleen Baker	6
	Sarah Craft	24
	Rebecca Hagedorn	45
	Jonathan Tucker	97
	Mimi Bukeirat	14

55	Tuesday Moats
	<b>Brian Simmons</b>
60	Amanda Marple
67	Christopher Doss

# PARTICIPANTS BY SENATE DISTRICT

Senate #	Participant	Number
01	Spencer Bell	8
	Matthew Ford	41
	Ryan Mezan	65
	Kristen Mastrantoni	58
	Kayla McLaughlin	62
	Cody Mullens	69
	Richard Nolan	71
02	Randy Smith	93
	Emily Ramezan	77
	Kathleen Baker	6
	Virginia Cunningham	25
03	Candace Bias	10
	Aric Clegg	18
	Jonathan Tucker	97
	Mariah Cottrill	22
04	Jonathan Rhodes	81
	Erin Fankhanel	36
	Samuel Cogar	20
	Noah Searls	89
	Emily Rector	79
	Nicole Sadecky	84
	Luke Sadecky	85
	Megan Guetzloff	44
	Victoria Daniel	28
	Bridgett Dudding	32
	Scott Harper	46
05	Seth Baker	5
	Aaron Holland	49
	Olivia Milam	66
	Aedan Somerville	94
	Scott Taj	96
	Katelyn Weiger	101
	Michaela Reynolds	80
	Alexis Pandelios	74
	Lee Chirpas	17
	Sam Ransbottom	78
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06	Vatharina Enga	25
06	Katherine Engo	35 42
ΛQ	James Fugett	103
08	Andrey Yanev	
	Dylon Watson Ciara Bennett	100 9
		9 104
	John Yost	
	Emily Peal	76
	Elijah Roberts	82
	Christopher Newman	70
00	Denna Davari	29
09	Matthew Merson	64
	Stacy Farley	37
	Marjorie McCoy	61
10	Brett Floyd	39
10	Kristen Shafer	90
	Katherine Wade	99
11	Emily Vandevender	98
11	Samuel Canfield	16
	Tuesday Moats	67
	Brian Simmons	91
	Catherine Hefner	47
	Natasha McMann	63
	Tyson Currence	26
12	Michael Elza Elizabeth Arnold	34 4
12		
	Devin Heitz Sundus Lateef	48 52
13	Robert MacDonald	55
13		56
	Andrew Maloney	86
	Amy Sardone Brittany Abruzzino	2
	Sarah Craft	24
	Rebecca Hagedorn	45
	Mimi Bukeirat	14
14	Nicholas Ohi	73
14	Kelby Fetter	75 38
15	Amanda Marple	57
16	Christopher Doss	31
17	Daniel Davis	30
1/	Hajer Mazagri	59
	Haylie Ballard	7
	Tabatha Slater	92
	Allen Duffy	33
	Erica Bickham	33 11
	Ashley Moore	68
	Tisiney Moore	00

Jordan O'Dell	72
Brittany Cyrus	27

# **OUT-OF-STATE PARTICIPANTS**

State	Participant	Number
CA	Brandy Ledesma	53
KY	Kristen Campbell	15
MD	Tavon Johnson	50
MD	Hannah Clipp	19
MD	Kaylah Bovard	12
NJ	Miles Gray	43
NJ	Justine Schultz	88
NY	Ellen Aguilera	3
ОН	Stacy Fooce	40
PA	Daniel Lukich	54
PA	Melanie Wieland	102
PA	Quinn Jones	51
PA	James Adballah	1
PA	Stephen Sullivan	95
PA	Rebecca Brown	13
PA	Evan Collins	21
VA	Jacob Sarmiento	87

# PARTICIPANTS BY FIELD (first authors only) #

# Astronomy

Virginia Cunningham	25
Natasha McMann	63
Amy Sardone	86
Allen Duffy	33
-	

# Biology

Elizabeth Arnold	4
Spencer Bell	8
Candace Bias	10
Erica Bickham	11
Mimi Bukeirat	14
Kristen Campbell	15
Samuel Canfield	16
Aric Clegg	18
Evan Collins	21
Tyson Currence	26

Victoria Daniel	28
Michael Elza	34
Erin Fankhanel	36
Kelby Fetter	38
Matthew Ford	41
James Fugett	42
Miles Gray	43
Devin Heitz	48
Sundus Lateef	52
Daniel Lukich	54
Kristen Mastrantoni	58
Ryan Mezan	65
Tuesday Moats	67
Ashlet Moore	68
Cody Mullens	69
Emily Peal	76
Emily Ramezan	77
Elijah Roberts	82
Luke Sadecky	85
Jacob Sarmiento	87
Randy Smith	93
Business	
Kristen Shafer	90
Kristen Shafer Stephen Sullivan	
Kristen Shafer Stephen Sullivan Katherine Wade	90 95 99
Stephen Sullivan	95
Stephen Sullivan Katherine Wade	95
Stephen Sullivan Katherine Wade  Chemistry	95
Stephen Sullivan Katherine Wade  Chemistry Ellen Aguilera	95 99
Stephen Sullivan Katherine Wade  Chemistry Ellen Aguilera Bridgett Dudding	95 99 3
Stephen Sullivan Katherine Wade  Chemistry Ellen Aguilera Bridgett Dudding Stacy Farley	95 99 3 32
Stephen Sullivan Katherine Wade  Chemistry Ellen Aguilera Bridgett Dudding	95 99 3 32 37
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff	95 99 3 32 37 44
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri	95 99 3 32 37 44 49
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy	95 99 3 32 37 44 49 59
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri	95 99 3 32 37 44 49 59 61
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy Christopher Newman	95 99 3 32 37 44 49 59 61 70
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy Christopher Newman Jordan O'Dell	95 99 3 32 37 44 49 59 61 70 72
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy Christopher Newman Jordan O'Dell Noah Searls	95 99 3 32 37 44 49 59 61 70 72 89
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy Christopher Newman Jordan O'Dell Noah Searls Tabatha Slater	95 99 3 32 37 44 49 59 61 70 72 89 92
Stephen Sullivan Katherine Wade  Chemistry  Ellen Aguilera Bridgett Dudding Stacy Farley Megan Guetzloff Aaron Holland Hajer Mazagri Marjorie McCoy Christopher Newman Jordan O'Dell Noah Searls Tabatha Slater	95 99 3 32 37 44 49 59 61 70 72 89 92

Computer Science	/Information Technology
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computer science/information recimology	
Seth Baker	5
Kathleen Baker	6
Daniel Davis	30
Quinn Jones	51
Olivia Milam	66
Derrick Paris	75
Jesus Ruvalcaba	83
Aedan Somerville	94
Scott Taj	96
Dylon Watson	100
Andrey Yanev	103
Engineering	
Haylie Ballard	7
Kaylah Bovard	12
Lee Chirpas	17
Sebastian Cousin	23
Denna Davari	29
Brett Floyd	39
Scotto Harper	46
Catherine Hefner	47
Tavon Johnson	50
Robert MacDonald	55
Andrew Maloney	56
Nicholas Ohi	73
Justine Schultz	88
Melanie Weiland	102
Brandon Moore	68
English	
Emily Vandevender	98
<b>Environmental Studies</b>	
Hannah Clipp	19
Sarah Craft	24
Jonathan Rhodes	81
Nicole Sadecky	84
Geography	
Amanda Marple	57

Matthew Merson	64
Brian Simmons	91
Ditali Silililolis	71
Mathematics	
Samuel Cogar	20
Physics	
Christopher Doss	31
Johnathan Tucker	97
Political Science	
Sam Ransbottom	78
Emily Rector	79
Psychology	
Ciara Bennet	9
Rebecca Brown	13
Mariah Cottrill	22
Brittany Cyrus	27
Katherine Engo	35
Stacy Fooce	40
Brandy Ledesma	53
Narsiyra McCorkle	60
Kayla McLaughlin	62
Richard Nolan	71
Alexis Pandelios	74
Michaela Reynolds	80
Katelyn Weiger	101
Sociology	
Rebecca Hagedorn	4
PARTICIPANTS BY INSTITUTION (first authors only)	#
Concord University	
Katherine Engo	35
Kristen Shafer	90
Katherine Wade	99
Stacy Farley	37
Matthew Merson	64

<b>Fairmont State</b>	University
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Fairmont State University	
Elizabeth Arnold	4
Devin Heitz	48
Glenville State College	
Samuel Canfield	16
Emily Ramezan	77
Randy Smith	93
Jonathan Rhodes	81
Manahall University	
Marshall University	4.5
Kristen Campbell	15
Erin Fankhanel	36
Miles Gray	43
Tuesday Moats	67
Jacob Sarmiento	87
Aaron Holland	49
Marjorie McCoy	61
Noah Searls	89
Seth Baker	5
Daniel Davis	30
Olivia Milam	66
Derrick Paris	75
Aedan Somerville	94
Scott Taj	96
Dylon Watson	100
Andrey Yanev	103
Brian Simmons	91
Samuel Cogar	20
Sam Ransbottom	78
Stacy Fooce	40
Alexis Pandelios	74
Michaela Reynolds	80
Katelyn Weiger	101
Shepherd University	
Jesus Ruvalcaba	83
University of Charleston	
Hajer Mazagri	59
John Yost	104
Emily Rector	79
Ciara Bennet	9
Brittany Cyrus	27

West Liberty State College	
Spencer Bell	8
Matthew Ford	41
Daniel Lukich	54
Luke Sadecky	85
Nicole Sadecky	84
<b>,</b>	-
West Virginia Institute of Technology	
Haylie Ballard	7
Kaylah Bovard	12
Sebastian Cousin	23
Brett Floyd	39
Tavon Johnson	50
West Virginia State University	
Allen Duffy	33
Erica Bickham	11
Victoria Daniel	28
Ashley Moore	68
Emily Peal	76
Elijah Roberts	82
Bridgett Dudding	32
Megan Guetzloff	44
Christopher Newman	70
Jordan O'Dell	72
Tabatha Slater	92
Nasiyra McCorkle	60
Woot Virginia University	
West Virginia University Virginia Cunningham	25
Natasha McMann	63
Amy Sardone	86
Candace Bias	10
Mimi Bukeirat	14
	18
Aric Clegg	26
Tyson Currence	
Michael Elza	34
Kelby Fetter	38
James Fugett	42
Sundus Lateef	52 50
Kristen Mastrantoni	58
Ryan Mezan	65
Cody Mullens	69

Stephen Sullivan	95	
Ellen Aguilera	3	
James Abdallah	1	
Kathleen Baker	6	
Quinn Jones	51	
Lee Chirpas	17	
Denna Davari	29	
Scott Harper	46	
Catherine Hefner	47	
Robert MacDonald	55	
Andrew Maloney	56	
Nicholas Ohi	73	
Justine Schultz	88	
Melanie Wieland	102	
Emily Vandevender	98	
Hannah Clipp	19	
Sarah Craft	24	
Amanda Marple	57	
Christopher Doss	31	
Jonathan Tucker	97	
Brittany Abruzzino	2	
Brandy Ledesma	53	
Kayla McLaughlin	62	
Richard Nolan	71	
Rebecca Hagedorn	45	
Wheeling Jesuit University		
Evan Collins	21	
Rebecca Brown	13	
Mariah Cottrill	22	

# 1. Real Mountaineers burn couches (and tell their friends online): Facebook posts in relation to group identity

### James Abdallah

West Virginia University Communications/Journalism Advisor: Nicholas Bowman

College students use their social media profiles to engage in a face-negotiation in order to make themselves attractive to peer social groups. However, what is attractive to those targeted audiences may not be attractive to a larger audience in their social network. This is especially true if the larger audience can include the poster's parents or future employers. According to the social identity model of deindividuation effects (SIDE) model, when students identify strongly as a member of a group, they may craft posts that reflect this group identity, which may or may not be seen as acceptable to others in their social network. In a one-to-many form of communication like a social media website, a person may have many small groups of people in their social network that they intend messages for, but their actual audience of posted messages is likely their entire network as a whole. This concept, where a person may post a certain item for a group that is seen across their social network, is called context collapse. This proposed study will analyze how group identity shapes the way people post updates. Students from a large Mid-Atlantic university will be surveyed about their group identity, asking the participants how strongly they feel about their identity, how they and others perceive their group, and how they post about their group. We will analyze students' actual Facebook posts and compare these posts to their survey responses. We will collect these posts by capturing them from the participant's actual Facebook wall. We expect that the stronger someone's group identity, the more they will post statuses that show their membership of these groups. We also explore the impact of other variables, such as one's social media experience and perceptions (their own and others) of their groups with this expected relationship.

# 2. West Virginia Primary Care Physicians' Perceived Barriers and Facilitators to Providing Behavioral Counseling for Weight Loss

### **Brittany Abruzzino**

West Virginia University Psychology

Advisor: Melissa Ventura-Marra

West Virginia (WV) has among the highest rates of obesity and obesity-related health conditions in the nation. Nearly 70% of adult West Virginians are overweight or obese. Obesity leads to increased risk of cardiovascular disease (CVD) and diabetes, decreased functionality and quality of life and increased health care costs. To reduce obesity and lessen the risk of CVD, the American Heart Association recommends primary care providers (PCPs) provide or refer patients to nutrition professionals for dietary counseling if they are overweight (BMI 25.0-29.9) with 'one CVD risk factor or obese (BMI '30). An on-line survey of WV PCPs was conducted to assess current nutrition counseling practices,

and to identify PCP perceived barriers to providing counseling or referring patients to a registered dietitian nutritionist (RDN) for counseling. Thirty-six physicians completed the survey. Most PCPs said they provide dietary counseling, but only half often or always provide specific diet instructions. PCPs perceived lack of patient compliance (67%), not enough time in a routine visit (53%), lack of referral sources (47%), and lack of patient interest (47%) as barriers to providing nutrition counseling. Only 14% said they often or always refer overweight/obese patients to a RDN for counseling for weight loss. The primary barriers to making referrals were uncertainty about insurance coverage (73%) and not knowing a dietitian in their area (30%). Fifty-eight percent of PCPs felt that without increased access to programs and nutrition professionals, they were not likely to have resources to provide behavioral counseling to promote a healthful diet and physical activity to all patients who could benefit. A large majority said they would be interested in a telenutriton program that would provide dietary counseling to their patients in their homes (89%) and a health coaching service that would provide support for patients between office visits (92%). WV PCPs recognize the importance of dietary counseling in reducing obesity and related conditions, but implementation of the new clinical care guidelines is impeded by uncertainty of insurance coverage, insufficient use of dietitian services and low accessibility of comprehensive lifestyle programs. Nutrition-related programs that consider physician's time, training and referral sources are needed in order to comply with new preventative guidelines. The results of this study will guide the development of interventions aimed at reducing barriers to nutrition counseling, thus reducing obesity and related chronic conditions in WV.

### 3. Gold catalyzed cross-coupling using arenediazonium salt as the oxidant

Ellen Aguilera West Virginia University

Chemistry

Advisor: Xiaodong Shi

Discovery of the catalytic property of gold (Au), supposedly an inert metal, has led to a 'catalytic gold rush' among chemists. However, the cross-coupling reactivity of gold is quite limited because of the high oxidation potential between Au (I) and Au (III) requiring a strong external oxidant such as SelectFluor or PIDA. Recently, Glorius and Toste (J. Am. Chem. Soc. 2013,135) successfully reported a dual catalytic gold and photoredox system, in which Au (I) could be oxidized by a photocatalyst and diazonium salt rather than a strong external oxidant. We sought to use the combination of both systems to yield the crosscoupling of diazonium salts with alkynes, reviewing that the reaction could proceed in the absence of a photocatalyst. This indicated the diazonium salts could, alone, act as the oxidant during gold catalysis. We investigated the reaction of an arenediazonium salt B. acting as a weaker internal oxidant, with a terminal alkyne A catalyzed by Au (I) to form the cross-coupling product C (Scheme 1). We hypothesized a proposed mechanism of Au (I)-Au (III). Starting with Au (I) reacting with the alkyne, we observed the formation of gold acetylide, which is proved to be crucial for the oxidation of Au (I) to Au (III). The alkynyl group is a potential electron donor that makes gold more electron rich, decreasing its oxidation potential. After the gold acetylide reacts with the diazonium salt, there is the

confirmed appearance of a diazo-gold (III)-alkynyl complex by Desorption electrospray ionization- mass spectrometry (DESI-MS). We hypothesize that the cationic Au (I) will donate two electrons to the diazonium salt, forming a nitrogen gold bond. Although the DESI-MS confirmed the appearance of a diazo-gold (III)-alkynyl complex, we are still investigating the mechanistic pathways leading up to and following this critical intermediate. Greater mechanistic understanding will provide insight into the future potential of redox gold catalysis. With a more refined picture describing the inner workings of this system, we will seek to extend this methodology to new and powerful transformations towards the synthesis of complex molecules.

# 4. Assessing the impact of Marcellus shale drilling on stream health using Daphnia magna and benthic macroinvertebrates

#### **Elizabeth Arnold**

Fairmont State University Biology

Advisor: Mark Flood

The Marcellus natural gas trend, stretching across Pennsylvania, New York, Ohio, and West Virginia, has provided a new means for obtaining natural gas. This gas is retrieved by means of hydraulic fracturing (commonly known as fracking). Fracking is accompanied by negative environmental impacts, including, though not limited to, water contamination. Benthic macroinvertebrate studies are a useful means of measuring water quality because larger and more varied populations typically correlate to healthy water. The survival rates of Daphnia (water fleas) are also indicative of water quality because these creatures are sensitive to dissolved oxygen, pH, and chemical contaminants. Due to the introduction of pollutants and runoff, it was hypothesized that macroinvertebrates would decrease in number, variation, and survivability at testing areas below the Marcellus shale fracking sites.

### 5. Framework for an Adaptable Wireless Network of Sensors

#### Seth Baker

Marshall University Computer Sciences Advisor: Paulus Wahjudi

Wireless sensor networks facilitate remote monitoring and analysis of environmental or physical conditions. At present, no extensible wireless sensor network exists based primarily on open-source development tools and low-power radio frequency communication protocols. The aim of this research project was to develop a prototype for an extensible, low-cost, and rapidly deployable wireless sensor network. During the course of the research, four wireless sensor nodes and a data platform were developed. Data collected by the nodes includes temperature and humidity readings, as well as indicators for the presence of carbon monoxide and methane gas. Data is transmitted to a base station, which stores the data in a database. The data is retrievable through a web

interface. The framework employs a multi-tiered architecture built using the Python programming language, the Django web framework, the PostgreSQL database management system, the Arduino hardware platform, and the ZigBee communication protocol. Since a conscious decision was made to develop the hardware and data platform using free and open-source software, it is possible for other researchers to extend or modify the framework to suit their interests and needs.

## 6. Speak Your Mind: A Proof of Concept Neuroheadset Assistive Device for Aphasia **Patients**

### Kathleen Baker, Tyler Durham and Eric Harshbarger

West Virginia University **Computer Sciences** 

Advisor: Frances Van Scoy

Using the Emotiv EEG headset, electric signals within the brain are captured and converted into voiced speech through a computer program, accessing a number of vital phrases representing human necessities and allowing for effective communication for those This project builds on work done by a current member of the rendered unable to speak. group in recognizing different pizza toppings through 14-dimesnional analysis of each sensor from the headset, and the sensors are as follows: AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8, AF4. These sensor names are based off of the International 10-20 System. Clusters for each pizza topping were saved as a training set and then compared to later to be matched by computing the distance between what the user was currently thinking versus what had been saved through the use of centroids. If there is a match, then the user is notified of the match to see whether it was correct or not. Training for each word is saved, and the user is allowed to retrain or train further on the selection of words available to the user. If a user has not trained on the word, no matching can occur. The specific regions of the brain that are of interest for this project include the Broca's area and Wernicke's area. Both areas are important to language. The first is used for speech production, while the second is for written and spoken language. Within West Virginia. there are a high number of stroke victims which is one of the leading causes for Aphasia along with traumatic brain injury. In 2010's West Virginia's State Health Profile, West Virginia ranked 40th in the nation for the percentage of stroke victims that had occurred, showing the level of need for this kind of project in our state. Therefore, in doing this project, the authors hope to create an interface for rehabilitation in those who have Aphasia with this new technology. However, past the scope of this project, the authors would like to see more applications created for rehabilitative usage.

#### 7. Effect of Abutment Backfill Soil on Bridge Response

#### Haylie Ballard

West Virginia Institute of Technology Engineering Advisor: Eric Monzon

In a highway bridge, joints are provided at the ends to allow the bridge to undergo expansion and contraction under thermal changes without inducing secondary stresses. The joint gap separates the end the bridge and the abutment, which is at the approach of the bridge. The length of gap is determined through temperature analysis of the bridge, and it typically ranges from 2 inches to 4 inches. However, under extreme loading such as earthquake, the horizontal bridge displacement may be larger than the gap resulting in the bridge pushing against the backfill soil at the abutment. This results in damage of the deck and girders at the end of the bridge. However, this behavior is typically ignored in the design of bridges because inclusion of the abutment response complicates the analysis. This research investigates the effect of abutment resistance on the bridge response. Examination of the experimental data obtained from shake table tests of a 145-ft highly curved bridge and literature shows that the impact between the end of the bridge and the abutment when gap is closed results in damage to the deck, girders, and bearings. However, the resistance provided by the backfill soil results in smaller displacement at the columns, protecting the columns from damage. To simulate this response in bridge analysis, a method of incorporating the abutment resistance in the analytical model was developed. A simplified method of defining the abutment force-displacement relationship was also developed.

### 8. Life History of the Allegheny Crayfish in West Virginia

### Spencer Bell

West Liberty State College Biology Advisor: Zachary Loughman

Maryland, New York, Ohio, and Virginia are imperiled due to invasive species. For proper conservation, this species' life history under normal circumstances must be known. In order to establish this base line life history, populations in the northern panhandle of West Virginia were sampled monthly over a one year period. For all collected crayfish sex was determined, male reproductive form was determined, morphological measures were taken, and female reproductive attributes were noted. This collected data was compared to representative taxa from every river basin in West Virginia the Allegheny Crayfish is native to in order to determine if this species exhibits the same life history throughout the state. After comparisons were made the Allegheny Crayfish was found to exhibit a monotypic life history across West Virginia. As West Virginia contains over 50% of this species' range with West Virginia populations contiguous to Maryland, Ohio, and Virginia populations life

The Allegheny Crayfish is a common species in parts of West Virginia but populations in

#### 9. The Impact of Gender and Cognitive Dissonance on Social Media and Judgment

history data collected in West Virginia can be used to aid in conservation efforts

#### Ciara Bennett

University of Charleston Psychology

throughout the Allegheny Crayfish's range.

Advisor: Michael Bayly

This proposal was created in order to analyze behavior-based attitude change and cognitive dissonance. The study was adapted from Dillehay, Insko, & Smith (1966) who demonstrated how political beliefs could be altered by individual persuasion. A similar study was conducted by Cohen, Brehm, & Fleming, (1958) in which participants' were asked to write a paper opposing their personal beliefs on a controversial topic. The results yielded greater writing times for the participants who had to oppose their beliefs. The purpose of my proposed study is to discover if the framing of an article on social media impacts the participants' self-reports of the degree social media influences their judgment. It is expected that the tone of the article (positive or negative) will influence the degree of impact of social media on judgment and that the effect will be more pronounced in females than males. Cognitive dissonance suggests that if participants changed their views, it is because they had experienced psychological tension from reading the articles and needed to alter their views to relieve this tension. University of Charleston undergraduate students will be used as participants in this IV x PV factorial design in exchange for extra course credit. The participants will be between the ages of 18-25. Additional demographic information will be obtained from each participant. It is expected that there will be 40 participants in this research experiment. All participants will be given a pretest questionnaire that will measure their views of social media influence within their peer group. The questionnaire will consist of 5 point Likert-type scale items that measure beliefs of social media influence on an individual. Next, participants will be randomly assigned into one of two conditions in which they will either read a positively or negatively framed article about social media influence. Then participants will be given a similar posttest questionnaire that will measure if their beliefs have changed. The difference scores between the pretest and posttest measures will be calculated to determine if the views of the participants had changed or been altered in any way. Possible implications of this study include participants' amount of social media usage may be impacted. Another possible implication could be that the amount of males and females may not be equal within groups, but this can be accounted for by randomly assigning a specific number of males and females to each experimental condition.

# 10. Use of a bacterial agent, Pseudomonas aeruginosa expressing ExoS, to identify alterations in plasma membrane properties predictive of malignant transformation

#### **Candace Bias and Samantha Knowlton**

West Virginia University Biology Advisor: Joan Olson

Ninety percent of cancer deaths relate to tumor metastasis, highlighting the importance of identifying the metastatic potential of primary tumors in treatment strategies. Currently, there is no way of diagnosing whether a primary tumor will become metastatic. Previous studies in our laboratory found that infection of tumor cell lines with Pseudomonas aeruginosa secreting a toxin, ExoS (Pa-ExoS), produced outcomes that differentiated non-metastatic and highly metastatic tumor cells. The goal of this study was to use live cell

imaging of tumor cells infected with Pa-ExoS to characterize alterations in membrane properties predictive of metastatic disease. Initial studies using human prostate tumor cell lines found that highly metastatic PC3 cells responded to Pa-ExoS by producing finger-like membrane projections that matured into nodules. In comparison, low metastatic LNCaP cells responded by losing adherence and contracting. In relating these outcomes to primary tumors, we found primary mammary tumor cells responded to Pa-ExoS by contracting and forming microspike-like adhesions, while primary prostate tumor cells rounded and lost adherence. Neither of the outcomes induced in the primary tumor cells by Pa-ExoS corresponded to that of highly metastatic cells, consistent with pathology reports that the tumors were non-metastatic. These preliminary studies support the concept that Pa-ExoS can be used as an in vitro diagnostic tool to assess metastatic properties of tumors.

# 11. Bumble Bee Diversity of Kanawha County with Special Emphasis on Two Endangered Species

#### Erica Bickham and Hunter Aliff

West Virginia State University Biology Advisor: Sean Collins

Populations of bumble bees (Bombus spp.) have been declining across the North American continent over the last 2 decades. Understanding the patterns of this decline will provide valuable insights into the possible cause or causes of this burgeoning ecological catastrophe. The decline and extirpation of bumble bees and other hymenopteran pollinators has the potential to affect crop production and decrease yields at a cost of hundreds of millions of dollars annually. The goal of our research is to assess the local diversity of bumble bees and to ascertain the presence and relative abundance of two critically endangered species (Bombus affinis and B. terricola) in Kanawha County. The results of this study will contribute to our understanding of the local diversity of these important insects and will also generate valuable data regarding the decline of these pollinators and perhaps provide insights to the locations of refugia where otherwise rare species may occur in sustainable densities. Bombus were collected from several sites throughout Kanawha County across a wide range of different habitat types. Data were collected on the following variables: species identities, species frequencies (overall and relative), location and habitat type; these data enabled us to analyze demographic data on total numbers of species present and their local distributions across the county. We also compared our present-day data with those from past years to identify declining species and community-level demographic shifts that may have occurred over the last few decades. Our data analysis revealed a trend similar to that found in other regions of North America, that being the decline of local species in the subgenera Thoracobombus and Bombus (s.s.). Our survey also revealed that Kanawha County supports very strong populations of species in the subgenera Pyrobombus and Cullumanobombus. A particularly interesting finding was a relatively vibrant population of the otherwise declining species B. auricomis (subgenus Bombias), indicating the potential for Southern West Virginia being a refugium for this species. Over the next few years, we anticipate expanding our survey to assess the health and sustainability of the population of bumble bees throughout West Virginia and to

address the factors that have led to their decline and to propose solutions for reversing this trend.

#### 12. WVU Tech SAE Mini Baja

#### **Kaylah Bovard and Wyatt McClead**

West Virginia Institute of Technology Engineering

Advisor: Winnie Fu

The Society of Automotive Engineers hosts a design competition each year wherein students around the world design, fabricate, and race a single seat, 10 horsepower vehicle. Points are awarded to each team based on their performance in events such as: design presentation, hill climb, suspension and traction, maneuverability, and a four hour endurance race. The West Virginia University Institute of Technology team plans to race a custom multi-speed transmission in the 2015 competition. The design from two years ago utilized a gear ratio of 5.4 and last year's design tried to compensate by using a 13.25 transmission with reverse. The 5.4 proved to be relatively fast, but did not make it up any of the hill climb due to limited torque. The 13.25 transmission came in 5th place in the sled pull, but only allowed the vehicle to reach a maximum speed of 18 miles per hour. Two senior mechanical engineering students are hoping to, this year, design a multi-speed transmission that will provide both torque and speed needed to be competitive in all events. The transmission will be completely designed and manufactured by the students in order to be completely tailored to the design parameters of this particular vehicle. It will incorporate a limited slip differential as well as a custom casing. The multiple speeds and fitted dimensions will make this year's vehicle the most competitive yet. Apart from the transmission, the team is working to improve all aspects of the vehicle design. This year's vehicle, as a whole, is being designed to be much lighter than previous years by using alternative materials such as carbon fiber panels rather than aluminum panels. The chassis will be shorter by 8 inches and narrower by 6 inches to improve handling and turning radius. The suspension will be lightened by using smaller diameter tubing with thinner walls. Our main design goal is for this vehicle to be light enough to be fast, but also have enough gear to pull hills by using a two speed transmission.

# 13. THE EFFECTS OF PEPPERMINT SCENT ADMINISTRATION ON AUGMENTING DRIVING PERFORMANCE DURING A DISTRACTED DRIVING SCENARIO

#### **Rebecca Brown and Emily Robinson**

Wheeling Jesuit University Psychology

Advisor: Bryan Raudenbush

Past research has shown that there is a relationship between scent and cognitive ability, scent and physiological responses, and scent and physical activities. The current study assessed the effects of a peppermint scent presented, while driving and being distracted with tasks and questions. Fifty-one undergraduate volunteers (18 males and 33 females)

participated in the study. The participant was in either the control room with no scent or the scented room with the pharmaceutical grade peppermint oil. Participants then "drove" using the driVR VR system for fifteen minutes. Researchers asked questions at one-minute intervals from a list of distractor tasks. After completion of the driving course, participants completed the NASA-TLX and POMS surveys. Data were analyzed using a univariate analysis of variance, which was applied to one variable of the NASA TLX at a time, and also to each subscale of the POMS. Results were significant showing participants reported less mental demand while driving in the peppermint-scented room, providing support for peppermint scent use as a non-pharmacological stimulant to promote driving alertness.

# 14. MiR-34a Inhibits Mitochondrial Function in Cerebrovascular Endothelial Cells and Opens Blood-Brain Barrier

# Mimi Bukeirat and James Simpkins

West Virginia University Biology Advisor: Xuefang Ren

The blood brain barrier (BBB) provides a barrier and interface between the peripheral circulatory and central nervous system (CNS), and maintaining its integrity is crucial for brain function and activity. This barrier is composed of cerebrovascular endothelial cells (CECs) held together by tight junctions, and by altering endothelial cell integrity BBB permeability can be affected. Our recent work demonstrate that mitochondria in CECs play a critical role in opening BBB. The maintenance of normal mitochondria function is based upon expression of mitochondria-associated proteins. microRNAs (miRNAs), are short noncoding functional RNAs that target certain messenger RNAs (mRNAs) through base-pairing between the microRNA and its mRNA targets, resulting in altered protein production. Bioinformatics analysis suggested that, one of important miRNAs, miR-34a targets several mitochondria-associated proteins, which indicate miR-34a may play an important role in the regulation of mitochondrial function and affecting BBB permeability accordingly. Using CEC culture model in vitro, we found that the BBB permeability was compromised with the overexpression of miR-34a. Interestingly, overexpression of miR-34a also significantly reduced oxidative phosphorylation as reflecting by robust reduction of maximal respiration and spare capacity in cultured CECs. These findings provide new knowledge to regulate BBB openings using miR-34a and may be important to offer a new treatment for stroke, vascular dementia and other neurological diseases.

# 15. Differentiating Human Blood from Animal Blood With FT-IR Microspectroscopy: A Study Using Support Vector Machine Algorithm

#### Kristen Campbell

Marshall University Biology

Advisor: Menashi Cohenford

A major difficulty encountered in crime scenes is the ability to differentiate human blood from animal blood. Current testing kits for differentiating human from animal blood have several shortcomings. For example, in addition to being costly, they typically rely on timeconsuming protocols and require the use of monoclonal antibodies. The purpose of this research project was to explore the utility of FT-IR technology for the development of a rapid, accurate, and user friendly method for discriminating human blood from animal blood; a test aimed at overcoming many of the difficulties and limitations of current testing procedures. To compare the FT-IR spectra of human blood with animal blood two types of analyses were performed. The first technique relied on the evaluation of spectra by standard classic spectroscopic methods. The second method relied on the use of Support Vector Machine (SVM) algorithm which offered a unique multivariate approach for the unbiased analysis of the data. The human samples used in this study included 107 blood specimens of which 35 were typed as blood group A, 26 as blood group B, and 21 and 25 as blood groups AB and O, respectively. The other blood specimens were obtained from animals of different sizes such as cats, dogs, horses, and mice with five samples taken from each of the animal species. 'Classic spectroscopic studies combined with SVM demonstrated distinct differences between human and animal FT-IR spectra, and verified the potential of the FT-IR method in a forensic setting, warranting further exploration of this technique.

### 16. Pocket gopher activity across elevation gradients

# Samuel Canfield, Jennifer Rudgers and Josh Lynn

Glenville State College Biology

Advisor: Ross Conover

It is important to understand the behavioral variation of a species across its distributional range, so organisms' habitat use and niche movements can be formulated by knowing where species are most active. Northern pocket gopher (Thomomys talpoides) and its relatives are well studied below 2,500m, but little is known at higher elevations (>2700m). This study investigated 1) what environmental factors (e.g., abiotic factors) determined their distributions at high elevations. We found that most northern pocket gopher activity occurred at mid-elevation (3000-3400m; P < 0.001) compared to higher and lower elevations. T. talpoides activity can be correlated with elevational abiotic factors (temperature, precipitation). As climate warming progresses, the mid-elevation activity may shift upwards in relation to the colder temperatures of higher elevations.

# 17. Investigation of indium zinc oxide (IZ0) sputtered PET flexible electrodes under various fatigue loading patterns

#### Lee Chirpas

West Virginia University Engineering Advisor: Kostantinos Sierros Transparent conductive oxides (TCOs) have proven to be essential electrode components for flexible devices such as displays, solar cells, and touch sensors. However, due to their brittle nature, further mechanical properties investigation is needed to determine their mechanical design limits during roll-to-roll manufacturing and in-service. Understanding such limits under various loading scenarios will aid towards designing and fabricating more reliable devices. In this work we investigate the effect of repeated mechanical stresses on IZO-sputtered PET films under various loading patterns. Sinusoidal and linearly increasing and decreasing, or 'sawtooth', fatigue strain cycles were performed for several thousand cycles. Experiments were performed using a micro-tensile instrument, which allowed in situ measurement of the electrical resistance of the conductive layer as well as its optical monitoring. IZO film (70 nm thick) crack onset experiments were performed in situ using an optical microscope to observe the integrity of the oxide film during loading. Then, pristine films were loaded to various strains below the measured crack onset strain of 2.5%. We observe that the films exhibit mechanical cracking, and therefore increased resistance for the first several hundred cycles. Cracks were observed and an increase of resistance of  $\sim$ 20% was measured for samples loaded to 2% strain. After the initial several hundred cycles, no further cracking or increase in resistance was observed. The latter maybe an important finding indicating a fatigue-induced ductility of the IZO layer not usually observed with other TCOs such as indium tin oxide for example.

# 18. Effects of Chronic Stress on Pancreatic Beta Cell Density in Obese and Lean Zucker Rats

## **Aric Clegg and Camille Leon**

West Virginia University Biology

Advisor: Randall Bryner

Chronic stress has been implicated as a possible contributing factor to the onset of Type 2 Diabetes Mellitus through its negative effects on the insulin producing 'cells of the pancreas. The objective of this study was to evaluate a model of chronic stress and the metabolic syndrome on beta cell density in rats. Obese (OZR) and lean Zucker rats (LZR) were randomly divided into stress (OZR-S, n=6; LZR-S, n=6) and non-stress (OZR-NS, n=3; LZR-NS, n=3). Stress included bath, damp bedding, no bedding, cage tilt, altered light cycles, and cage-switching for 7 hours/day, 5 days/week for 8 weeks after which animals were euthanized. Pancreases were harvested and mounted on cork using OTC freezing medium. Pancreas sections of 7\hat{E}m thickness were cut and collected on slides then stained using DAPI and Alexa-Fluor 546 targeting primary insulin antibodies. Slides were then imaged using the Zeiss LSM 510 Confocal microscope and Zeiss computer software. The insulin positive area of the stained islets was measured using the Image I program. The images of stained cells and islets were merged and the number of beta cells per islet recorded. A twoway ANOVA was used to compare the beta cell density (beta cell/Êm2 insulin positive area) among groups with significance set at p<.05. There was a significant main effect of stress with stressed animals having a lower beta cell density compared with non-stressed (Stressed: 0.00566ò.001; Non-Stressed: 0.00861ò.001Êm2). No differences were observed between OZR and LZR. These results indicate that 8 weeks of chronic stress caused beta

cell density to be reduced in both OZR and LZR and this was not affected further by the metabolic condition of the animals.

# 19. Comparing waterbird diversity, species composition, abundance, and use between a newly created wetland and an established wetland in West Virginia

### **Hannah Clipp**

West Virginia University Environmental Studies Advisor: Jim Anderson

Wetlands are currently protected by United States federal legislation and, in many cases, by state regulations. Permits to destroy or degrade wetlands usually require the creation, restoration, or mitigation of wetlands on-site or in another location. Thousands of hectares of wetlands have been constructed in compensation for wetland destruction and disturbance. However, literature shows that created wetlands do not consistently function as an ecosystem equivalent or replacement of natural wetlands. Therefore, it is critical to monitor and assess if created restored wetlands match the function and ecological services as natural or reference wetlands. One goal of wetland creation and restoration is to provide habitat for resident and migrant waterbirds. Waterbirds are important for ecological, economic, and aesthetic reasons, and many serve as game species for hunters. Migratory birds rely on wetlands, which provide breeding and nesting habitat, food sources, and stopover sites during migration. Information on how wetland restoration affects carrying capacity, how waterbirds use these wetlands, and how that use compares between created and reference wetlands in this region is limited. Therefore, the objective of this study is to assess and compare waterbird diversity, species composition, abundance, and use between a recently created wetland and an established wetland in the Pleasant Creek Wildlife Management Area near Grafton, WV. The newly created wetland was built in the summer of 2013, and the established wetland was created in 2001. Thirty-minute visual surveys were conducted from different locations around each wetland 2-4 days per week (half in the morning, half in the evening), starting in September and ending in early May of 2013'2014 and 2014-2015. Waterbirds were identified to species and sex when possible, and feeding activity was noted for each bird. To date, 12 and 25 species of waterbirds have been observed at the newly created and established wetland, respectively. Certain species, such as killdeer (Charadrius vociferus) and solitary sandpipers (Tringa solitaria), were more likely to be found in the new wetland, while others, including gadwall (Anas strepera) and ring-necked ducks (Aythya collaris), were more likely to be found in the established wetland. Data collection is ongoing, but preliminary data reveals that species richness is lower in the created wetland, though waterbird abundance and species composition appears to vary between the two wetlands, perhaps due to a difference in water surface area and depth.

### 20. Implementation of Radial Basis Function Methods in the Flat Limit

### Samuel Cogar

Marshall University Mathematics Advisor: Scott Sarra

Throughout modern history, partial differential equations' equations involving some quantities and how they change with respect to other quantities' have proven to be effective in modeling a variety of processes, from physical to financial. However, many partial differential equations are difficult or impossible to solve by hand, so the theory of numerical partial differential equations' the approximation of solutions through the use of computer algorithms'has received much attention over the years. Among the simplest numerical methods to implement utilize radial basis functions, and a specific class of these functions allows for the highest possible accuracy, known as spectral or exponential accuracy. This class of radial basis functions achieves this level of accuracy when its shape is somewhat flat, in the sense that the function has negligible curvature. Unfortunately, the most direct approach for implementing these methods involves solving for a collection of values which becomes difficult to approximate accurately on a computer precisely when the radial basis function is flat, resulting in a severe loss of accuracy. To remedy this problem, we consider so-called bypass algorithms which implement radial basis function methods in an alternate but equivalent manner that avoids loss of accuracy associated with the direct approach. We investigate recently developed bypass algorithms implemented on modern computer architecture and test their effectiveness and practicality, and we compare them with the more simple approach of implementing in extended precision'a more accurate representation of numbers on a computer. A solution to this accuracy loss problem will have profound impacts on any field which relies on numerically solving partial differential equations, such as weather forecasting, modeling groundwater flows involving chemical spills, and the development of clean coal technologies. With a proper bypass algorithm, these problems and many more will benefit from the simplicity and accuracy of radial basis function methods.

# 21. Standardization of E. coli Coliform Counting for the Determination of Stream Health from Combined Sewage Outflows Along Wheeling Creek

#### **Evan Collins**

Wheeling Jesuit University Biology Advisor: Andy Cook

Wheeling Creek has been under speculation in previous experiments at Wheeling Jesuit University by its biology department students, but nothing definitive has been ascertained from these studies so far. Using the EPA Clean Water Act of 1972 as a guideline, this research will determine the acceptable and safe levels of pollutants in the Wheeling Creek watershed, there will hopefully be no significant levels of fecal coliform (FC) contamination. According to the Environmental Protection Agency (EPA), combined sewer

overflow systems (CSOS) are a way in which domestic waste may be discharged into streams after heavy rainfalls, affecting 772 cities in the United States (Combined Sewer, 2013). For this reason it is necessary to make sure that the water in the stream does not exceed the legal limits of total coliform as well as E. coli coliform counts of 5.0 percent of samples per month (Basic Information, 2013). The Fecal Coliform (FC) count for West Virginia non-Ohio River streams must be maintained at or under 200 Colony Forming Units (CFU) per 100 mL of water, and no more than 10 percent can exceed 400 CFU per 100 mL over a sampling period of at least 5 samples per month (Bacterial Water, 2003). This is why samples will be taken inside of and outside of the CSOS along the creek, effectively other environmental factors influencing growth 'such as nitrates, phosphates and ammonia nitrogen 'it was later determined that these were superfluous and therefore eliminated from the study. Thusly, only the colonies, water level and the amount of rainfall for that day were considered as well as proximity and discharge of the CSOs. This points to the anthropogenic, i.e. human, interactions within the environment leading to a possible source of nonpoint fecal coliform pollution from storm drain runoffs as well as sewage leakage or other nonpoint sources. This study shows the relation of these CSOs to the amount of fecal coliforms in Wheeling Creek.

# 22. EFFECTS OF MALE INCOME AND MALE PHEROMONE SCENT ADMINISTRATION ON RATINGS OF ONLINE DATING PROFILES OF MALES MADE BY FEMALE PARTICIPANTS

#### Mariah Cottrill

Wheeling Jesuit University Psychology Advisor: Bryan Raudenbush

Previous research has demonstrated the significant relationship between physical attractiveness and annual income. The present study chose to investigate this relationship while also implementing a male pheromone, androstadienone, into the testing room. A internet profile was created, and the salaries of the portrayed person were manipulated into a low, medium, or high condition. Female participants were then also placed into either a male pheromone-scented or non-scented room and asked to complete a brief questionnaire concerning the profile. Females were more willing to have sex with the individual portrayed in the high salary condition and while undergoing the male pheromone-scented room. Results are discussed in terms of social anthropology.

### 23. Design and Analysis of a Microfluidic Valve

#### **Sebastian Cousin and Raul Torres**

West Virginia Institute of Technology Engineering Advisor: Farshid Zabihian

This research project was performed in order to design and analyze a fluid flow model (microvalves). The Computational Fluid Dynamics (CFD) and the Particle Image

Velocimetry (PIV) are integral parts of our investigation. The CFD provides a way to simulate physical phenomena that are impossible for analysis and difficult for experiments. PIV is a method, which provides a measurement of the velocity field. The PIV generates instantaneous velocity maps in a two dimensional cross section of flow problems. The spatial resolution and the accuracy of the measurement, if performed adequately, are considered to be high. The measured velocity can then be used for a wide range of post processing calculations, including velocity magnitude and direction, velocity gradient, viscous shear, stream function, vorticity, and others. The CFD offers us the ability to reconstruct the reality of fluid motion and behavior in order to better understand the natural phenomena under specified conditions, we are currently using COMSOL multiphysics as our CFD software. Utilizing the results from CFD we use the PIV to validate the certainty of those results. The project was performed by studying existing flow models on the ePIV (Educational Particle Image Velocimetry) and CFD. The practice of CFD and the PIV lead us to a better understanding of the components and characteristics for designing a fluid system. On becoming proficient with these instruments, we designed (using SolidWorks) a fluid flow model compatible with PIV. This model was studied and analyzed on the ePIV and CFD. The results of this investigation could increase knowledge in academic, manufacturing, medical, and other fields. We are currently more interested in how to use these techniques and tools in order to better analyze and design microvalves, for flow regulation. We are currently doing several 'proof-of-concept' modeling, simulation, and visualization works. Our expected outcome from this project is to further improve the performance of existing microvalves.

# 24. Effects of allelopathic plant matter in the early emergence rates and growth of native plant species

#### Sarah Craft

West Virginia University Environmental Studies

Non-native invasive plant species, particularly species with allelopathic properties, pose a great threat to the integrity of native ecological communities, interrupting natural competition patterns and costing the United States government and private sectors billions of dollars a year in eradication, control and remediation. Many invasive plant species utilize chemicals with allelopathic properties to alter the composition of the soil, often making it difficult for competing native species to undergo normal germination and growth patterns. In this investigation, plant matter, from three woody perennial plant species that have been documented to express allelopathic characteristics, was collected, artificially decomposed, and incorporated into soil treatments in order to test the effects of the incorporated plant matter on the germination rates of competing plant species. Two of the treatment plants are considered invasive in the state of West Virginia: tree of heaven (Ailanthus altissima) and Japanese barberry (Berberis thunbergii). Butternut or white walnut (Juglans cinerea), while not considered an invasive species, was selected as a treatment plant due to documented allelopathic properties exhibited by species in the same family (Juglandaceae). Species that are known occur in the same counties in West

Virginia as the treatment plants were selected based on fast germination rates (avg 7-10 days) in order to allow for a simple growth study. The subject plants selected (arugula (Eruca sativa), peas (Pisum sativum), and radishes (Raphanus sativus)) were introduced to the growing medium (potting soil) with different treatments. The study supported difficulties in the re-establishment of native plant populations and native ecological communities in areas infested by these allelopathic species.

#### 25. The Clustering of Galactic H II Regions

### Virginia Cunningham

West Virginia University Astronomy Advisor: Loren Anderson

Star formation, and especially massive star formation, is inherently clustered. H II regions are areas of ionized hydrogen associated with the formation of the most massive stars in our galaxy and these stars within them are frequently found to be in clusters. The clustering of discrete H II regions tells us about how this clustering proceeds from small- to large-scale structures. Using the WISE catalog of galactic H II regions, we perform clustering analysis on these massive star-forming environments with the Minimum Spanning Tree (MST) and Friends-of-Friends (FOF) algorithms following the methods of Billot et al. We define individual H II regions as either isolated or clustered. We find that 55.3% of the sources are clustered when using the MST method and 42.6% are clustered with the FOF and that the clusters in the most distant arm of the Milky Way exhibit a deviation of 0.03 degrees from the galactic plane. An application of this method will be to derive distances to sources which are lacking estimates. The analysis of these clusters will contribute to the knowledge of H II regions, their surrounding environments, and their evolutionary life cycles.

# 26. Effects of Slice Thickness on Quantitative Computed Tomographic Characteristics of the Lumbosacral Vertebral Canal in German Shepherds

#### **Tyson Currence**

West Virginia University Biology Advisor: Jeryl Jones

Lumbosacral (lower back) disease is a frequent cause of early retirement and euthanasia in military working dogs. To develop more evidence-based treatments and preventative measures for this problem, more precise methods of quantifying characteristics associated with lumbosacral disease are needed. The goal of this study was to determine if computed tomographic (CT) slice thickness affects vertebral canal area measurements in the lumbosacral region of German shepherd military working dogs. Dogs were retrospectively recruited from archives at the Holland Military Working Dog Veterinary Hospital at Lackland Air Force Base, TX during the period of Dec. 2008 to July 2011. Inclusion criteria

for the study were German shepherd breed, computed tomography (CT) scans of the lumbosacral region that were acquired with 0.625 mm slice thickness, and available medical record data at the time of CT scanning. A single observer with prior training measured area of the vertebral body, vertebral canal, and vertebral fat at each of 6 locations: cranial S1, caudal and cranial L7, caudal and cranial L6, and caudal L5 using 0.625mm slice thickness CT scans and an image analysis workstation (MacPro, Mac OS X 10.6.8, Cupertino, CA; OsiriX 4.1.2, 32 bit, http://www.osirix-viewer.com/). Slice thickness was adjusted to 5.000mm and the same measurements were repeated. The ratios of canal to vertebral body area, fat to vertebral body area, and fat to canal area were obtained using commercial statistics software (SAS, version 9.4, SAS institute, Cary, NC). Statistical tests of association were conducted between the area ratios measured using 0.625mm and 5.000mm slice thicknesses at each vertebral location. Measurements at some locations were not normally distributed, therefore Spearman correlation was used. All area ratio measurements were significantly correlated for 0.625mm and 5.000 mm slices (p<0.05) at the following locations: cranial S1, cranial L7, caudal and cranial L6, and caudal L5. Findings from this study indicated that measurements from 0.625 and 5.000mm slices are correlated but not interchangeable. Therefore, slice thickness should be uniform in future studies using CT to measure treatment effects for dogs with lumbosacral disease.

### 27. Intelligence Perception

### **Brittany Cyrus**

University of Charleston Psychology Advisor: Martha Spiker

This study was adapted from Harold Kelley's (1950) warm cold study which demonstrated how initial perceptions can easily be influenced by misleading information about the personality of the speaker. A similar study was by Asch (1946) discovered that participants rated the "warm" speaker as more sociable, popular, good natured, generous, humorous, and humane. Willis and Todorov (2006) also found that impressions are formed within 100 milliseconds (one 10th of a seconds). In addition they also found that longer exposure does not significantly increase accuracy of first impressions, although it does increase perceived accuracy of the impression. The purpose of the present study is to see if leading statements (primes) have an effect on the perception of intelligence. University of Charleston undergraduate students agreed to participate in exchange for extra course credit. There were two experimental groups that were given leading statements about the speaker featured in a video and were then asked to watch the short video. The key manipulation was the framing of the leading statement (prime). Half of the participants in the experimental groups were told the speaker was very intelligent and the other half were told the speaker was dense. All were asked to complete a survey of questions about the speaker and then were released. The survey consisted of items pertaining to the speaker's intelligence and other characteristics. The participants used a seven point Likert-type scale for the ratings. The control group was shown the video and given the survey with no leading statements. It was expected that experimental participants' rating of the speaker's intelligence would be in alignment with the verbal primes, while control participants'

ratings of the speaker should remain objective. Results (F (2, 27) = 3.4, p <.05) supported the prediction that an individual's perceptions can be easily influenced by other people's perceptions. These results show how important first impressions are and how influential they can be.

# 28. SEQUENCING OF RIBOSOMAL AND MITOCHONDRIAL DNA FOR SPECIES OF PARAORYGMATOBOTHRIUM

#### Victoria Daniel

West Virginia State University Biology

Advisor: Tim Ruhnke

Ruhnke (1994) erected the Paraorygmatobothrium for tapeworm species from shark host species. The present study concerns an expansion of the possible species diversity of Paraorygmatobothrium. Much of the recently discovered diversity is difficult to distinguish at the species level using morphology. For example, Jensen and Bullard (2010) identified four putatively new species from Gulf of Mexico that did not have clear morphological distinctions. A large subunit database was created for the genus. In the present study, 66 different sample of Paraorygmatobothrium were attempted with PCR over the summer with 28S ribosomal primers and of those sixty six, fourty two were positive. Twenty-two samples were attempted using CO1 primers and of those twenty two, seventeen have been positive. Analysis of sequence is ongoing.

# 29. Hydration study of hand/finger/nail system to understand mechanism of glove-related injuries

#### Denna Davari

West Virginia University Engineering Advisor: Ashish Nimbarte

Hand injuries, including fingernail trauma, are prevalent among astronauts. Throughout the U.S. space programs, they account for 75% of the total musculoskeletal injuries. These injuries do not just occur in space, but have also been reported during pre-flight training programs. Studies have shown that most of these hand/finger injuries are glove related. In a recent 2014 study performed at Johnson Space Center NASA discovered that when compared to a non-gloved setting, the atmosphere within the Extra Vehicular Activity (EVA) glove has poor ventilation, moderate to high air temperature, high relative humidity, and high hand moisture levels. Physical exertions performed by the hand/fingers under such conditions may lead to trauma such as fingernail delamination, a condition in which the fingernails start to detach from the nail beds. The issue is that it is not clearly understood what factors specific to glove use during hand/finger exertions are causing such injuries. Objective: The objective in the proposed study is to establish baseline data for the physiological response of the hand/finger/nail system to atmospheric

exposures typical during hand exertions performed using gloves. Overview of the Project: The project objective will be achieved by performing an experimental study. Human participants within each gender will be selected from the 5th, 50th, and 95th percentile stature. Two different types of gloves that are used in the workplace will be utilized, since it is not realistically possible to obtain an actual EVA glove. The two types of gloves include a cut resistant multitask glove, and a latex coated glove, both used for general maintenance, construction, and machinery work. Human participants will perform pinching and gripping tasks of different intensities under controlled conditions. Successful completion of the proposed project is expected to generate preliminary data related to the effect of factors specific to glove use on the physiological response of hand/finger/nail system. This knowledge would be useful in understanding the mechanism of pathogenesis of EVA glove-related hand or finger injuries.

#### 30. Simplified Concentration Prediction for Rapid Response to Chemical Spills

#### **Daniel Davis**

Marshall University Computer Sciences Advisor: Paulus Wahjudi

There are chemical facilities across the nation and around the world that are in close proximity to waterways. This increases the probability that a spill can impact the water supply of the surrounding area. In the case of such an event, public officials need to be well informed about the danger levels so that citizens in the affected area may be properly advised. A prime example of such an occurrence is the 2014 leak of thousands of gallons of 4-methyl-cyclohexane-methanol into the Elk River, only 1.5 miles upstream from the intake for West Virginia American Water's regional water treatment facility. In this case, there was significant uncertainty as to when the levels of the chemical were sufficiently depleted for the water to regain usability. Officials lacked a comprehensive tool that could quickly predict concentration levels in the water downstream from the spill. As a result, there were cases when the flushing techniques prescribed by a joint committee of government officials and industry professionals were not successful. Three Kanawha County Schools were forced to close after already having opened when the odor associated with the chemical resurfaced. Two individuals from Riverside High School were each taken to an area hospital after becoming sick from the strong odor. The most prominent water quality modeling software is the Environmental Protection Agency's Water Quality Analysis Simulation Program (WASP). WASP provides a virtually comprehensive simulation of water quality response in the event of natural disaster or man-made pollution. It utilizes a compartment-based modeling system for aquatic systems that allows investigation of up to three dimensional systems. Its detailed features make WASP extremely useful for detailed research, but not for an analysis when a quick decision is necessary. I propose a system that utilizes a compartmentalized water flow model to execute a simplified simulation to provide policy makers with the information they need to make immediate decisions impacting public safety. The system, currently under development, utilizes near real-time waterway information from the National Oceanic and Atmospheric Administration, and requires minimal specialized knowledge of the waterway parameters. If the user can

supply the width of the channel at periodic intervals, and select the spill location on a map, he or she can use the simulation. This system will be hosted as a web application so that policy makers anywhere can use it as a decision support system to help protect the public from potential disaster.

#### 31. Space Weather: How the Solar Wind Affects its Efficiency

## **Christopher Doss**

West Virginia University Physics Advisor: Paul Cassak

Magnetic reconnection occurs in hot gases (plasmas) where a magnetic field flips directions. It breaks and cross-connects, which drives a jet of plasma. Since its discovery, scientists have learned much about phenomena where reconnection occurs, such as solar flares and interactions between Earth's magnetic field and the solar wind. Due to the complexity of reconnection, numerical simulations of reconnection often use many simplifications. This research investigates a configuration that regularly occurs where the solar wind interacts with Earth's magnetic field - magnetic fields of different strengths and plasmas with different densities with a bulk flow caused by the solar wind. This research is important to space weather, which addresses how this interaction damages satellites and causes power outages. This study uses two-dimensional two-fluid numerical simulations performed on a supercomputer. We find that bulk flow makes reconnection slower. Also, the reconnection site is observed to drift at a velocity related to the flow speeds on either side of the reconnection site. We predict the drift speed of the reconnection at Earth.

### 32. Microwave Synthesis of Succinic Anhydrides

#### **Bridgett Dudding**

West Virginia State University Chemistry Advisor: Tom Guetzloff

generate different combinations of amines and anhydrides to form Imides. The actual synthesis of the amine and anhydride takes around 8-10 minutes rather than the 8 plus hours as other methods founded in the literature. The resulted product from the microwave synthesis is removed from the microwave and then heated in a mixture of 50% ethanol and 50% water until it dissolves. Then, the filtered and dried product was purified by flash chromatography by using 40% hexane 60% ethyl acetate solvent. The collected samples were tested by TLC analysis to determine if the desired product was isolated. The wanted products were concentrated by rotovaping. Since there is little to no solvent usage

in creating our desired product, the microwave method is cheaper and faster than more traditional synthesis techniques. This method is great for classroom use and allows

The research that has occurred in our laboratory is utilizing microwave synthesis to

students to grasp a better understanding of basic organic concepts by generating many products and looking at percent yields and which will help students determine which aniline/anhydride combination gives the best and worst results. These combinations can be used outside of the academic lab as well and can serve a purpose in our everyday lives. For example, some succinimide derivatives can be used as insecticides, while other compounds are used for agriculture agents, drugs, or dyes. Therefore, generating and isolating these compounds by a method at faster times and lower costs can be beneficial to the scientific community.

### 33. What caused landslides in Valles Marineris, Mars 'the sequel?

#### **Allen Duffy**

West Virginia State University Astronomy

Advisor: Andrew Schedl

Akers et al. (2012) proposed that impacts and landslides in Valles Marineris may be causally linked if 1) an impact crater and landslide are the same age and 2) if this landslides lay in a region where there is a '50% chance that a particular crater caused this landslide. Out of 56 well dated landslides, only 6 landslides and 3 impact craters met both of the above conditions. This suggests that Marsquakes are a better explanation for most landslides than meteorite impacts. In this study, we examined craters at distances where there was a 5-50% probability of an impact causing a corresponding landslide. Crater degradation states range from 1-4 where 1 is most modified (eroded) and 4 is least modified (Robbins et al. 2012) and thus degradation state is a proxy for age. For this study we examined impact craters at distances from Valles Marineris defined by the 5% probability curve for meteorite impacts causing landslides. Within this region the majority of craters are degradation state 1 and thus older than Valles Marineris, >3.5 Ga. There are no craters within this region that are degradation state 4. For craters in this region with degradation states 2 and 3 preliminary ages were determined. Most of these craters were '3.5 Ga. so they cannot be linked to landslides in Valles Marineris. For craters between 2.0 and 3.5 Ga there are 14 craters that lie between the c=10-3 and 10-4 5% probability lines and 9 craters that lie above c=10-3 the 5% probability line. There are 8 landslides in that age range so these landslides are unlikely to be all explained by meteorite impact. Approximately 40 landslides are <2.0 Ga and there are only 13 craters with preliminary ages in this range. Preliminary analysis shows that many of these craters lie above the c=10-4 5% probability line and hence are unlikely to be linked to landslides. We are now obtaining additional isochron ages to test preliminary results. Again, results are consistent with marsquakes causing most of the landslides.

# 34. Analysis of Wood Thrush (*Hylocichla mustelina*) Movement Patterns to Explain the Spatial Structure of American Ginseng (*Panax quinquefolius*) Populations

#### Michael Elza

West Virginia University Biology Advisor: James McGraw

American ginseng is America's premier wild-harvested, medicinal plant that inhabits the forest understory of eastern deciduous forests. Recent research using camera-traps showed that birds, particularly wood thrushes, disperse ginseng seeds, regurgitating viable seeds 15 – 37 minutes after consuming the berries. We carried out two studies to examine the potential effect of thrushes on spatial dispersion patterns of ginseng. First, for 28 natural populations of ginseng we created a clustering index (number of subpopulations / total individuals in the population), in order to quantify to what degree populations were structured into spatially separated units. Second, to analyze how far wood thrushes could disperse seeds, two wood thrushes were outfitted with radio transmitters and tracked for multiple days. The mean dispersion index differed for populations with and without wood thrushes (F= 5.411, p= 0.028). Over the time period in which wood thrush retain ginseng in their guts, the seeds would be dispersed between a mean distance of 15.2 - 21.7 meters. The observed distances ranged from 0 – 96.6 meters. These distances are comparable to the inter-cluster distances for ginseng populations with wood thrushes, which had increased spacing in comparison to those without wood thrushes. As wood thrush and ginseng populations are both experiencing declines, it is imperative to understand the interaction between these two species to facilitate conservation. These findings highlight the genetic and structural impact that wood thrushes have on ginseng populations and influence the plants' ability to respond to disturbances such as climate change, deer browse, and over-harvesting.

# 35. Clustering of Unrelated Words through Font Color

#### **Katherine Engo**

Concord University Psychology Advisor: Rodney Klein

Past research has shown that when participants are presented a list containing several groups of semantically related words in a free recall task, they tend to group the words together by their semantic meaning at output. This phenomenon is referred to as clustering. This experiment examines the possibility of clustering occurring for a list of semantically unrelated words that have been randomly assigned one of three font colors. The expectation is that the font color will act like a category in the free recall task and result in the clustering of semantically unrelated words by their font color at output.

# 36. Nanotherapy and immunohistochemical analysis for sepsis associated renal injury

#### **Erin Fankhanel**

Marshall University Biology

Advisor: Eric Blough

Although sepsis remains a leading cause of death for hospitalized patients and efforts for effective treatment are ongoing, little progress has been made in effectively treating and confidently identifying the pathogenesis of sepsis in organ damage. Because the kidney plays a vital role in maintaining health, this organ was chosen as a focus and knowledge of a general pathogenesis of septic shock renal injury would be helpful in the development of treatment and therapy for the condition. Using a Sprague Dawley cecal inoculum sepsis model, a study was conducted for the effects of cerium oxide nanoparticles on sepsis to evaluate the effectiveness of this nanotherapy and to understand the pathophysiology of the injury to the kidney. Through this study the kidney has also been examined in histological and biochemical techniques. In particular, several injury and inflammatory markers were investigated for their role in sepsis, including Kidney Injury Molecule-1 (KIM-1) and monocyte chemotactic protein-1 (MCP-1). This study indicates the large role of immune dysfunction and apoptotic pathways in the injury of the kidney and the potential for cerium oxide to be used as therapy based on this model.

# 37. Immunoglobulin G Biosensor based on Surface-Enhanced Raman Scattering Stacy Farley and Peng Zheng

Concord University Chemistry Advisor: Dana Alloway

Detection of an Immunoglobulin G antigen was carried out using a biosensor based on surface-enhanced Raman scattering (SERS). The biosensor consisted of a gold film with attached layer of antibody and antibodies with attached SERS probe. The SERS probe, gold nanoparticle@Raman label@SiO2 core-shell nanoparticles in which the Raman label, malachite green isothiocyanate (MGITC), is embedded between the gold core and SiO2 shell, produces a Raman peak at 1170 cm-1. When introduced to the system, the antigen was sandwiched between antibody on the film and antibody with attached probe leaving the probe on the film after washing. The intensity of the resulting Raman peak varied linearly with the logarithmic antigen concentration. Both gold nanospheres and gold nanostars were used, and it was found that nanostars provided better sensitivity. Given the design of the system, this biosensor could be adapted to other antibody-antigen pairs making it a valuable tool for quantitative detection.

# 38. Sensing Biofuel Crop Miscanthus x giganteus Yield in Marginal West Virginia Soils.

#### **Kelby Fetter**

West Virginia University Biology

Advisor: Eugenia Pena-Yewtukhiw

Increasing need to protect and sustain the world's dwindling fossil energy resources and vulnerable environment has led researchers to study alternative sources of energy. Biofuels are fuels made from 'energy-crops' such as Miscanthus x giganteus. Miscanthus x giganteus may be adaptable to conditions not favorable to food production, which could make marginal soil conditions (sloping and acidic) in West Virginia an attractive place to establish this crop. The use of sensors to predict biomass production early in the season will help to establish important logistical strategies such as fertilizer transport, harvest, product transport and placing. It is possible to use Normalized Difference Vegetative Index (NDVI) sensors to measure the greenness of the canopy of M.x giganteus; NDVI is a canopy vegetative index that is useful for predicting biomass production. The objectives of this research were: a) to determine the utility of NDVI readings to estimate Miscanthus x giganteus biomass under different soil conditions; b) to find the best time to measure NDVI in order to estimate biomass yield at harvest. The study hypothesis was that changes in plant growth patterns due to differences in soil productivity would not impact the effectiveness of NDVI readings as a tool to estimate biomass production. The experiment was performed at the WVU Organic Research farm. Five soil productivity/marginality levels soils were established on five residual fertility levels established by annual applications of 0, 2.2, 4.5, 9.0, and 18.0 Mg manure/ha from 2000 to 2005. M.x giganteus was planted in July of 2010. The measurements performed in 2014 were: soil health indicators (soil organic matter, bulk density, soil aggregation), NDVI (handheld Greenseeker, NTech Industries), and plant height (biomass estimation parameter), which were recorded daily between May and July. As expected, plant height/biomass differences between productivity/marginality treatments increased with time. Taller plants resulted in greater NDVI values. The trends in plant height and NDVI with time were similar between marginality levels. As a growth pattern indicator for Miscanthus, the shape of the NDVI curves versus time did not change with soil marginality/productivity treatment between May-July 2014. Soil productivity levels did not affect NDVI efficiency as a predictor of Miscanthus biomass. The highest correlation between NDVI (taken 16 May through 31 July daily) and final Miscanthuus x giganteus height (taken 25 June) was obtained on 6 June. From both practical and statistical perspectives, 6 June was the best date to measure NDVI for yield prediction purposes.

#### 39. Wood Gasifier Based Engine

#### **Brett Floyd and Corey Hall**

West Virginia Institute of Technology Engineering

Advisor: Farshid Zabihian

Brett Floyd Corey Hall West Virginia University Institute of Technology Advisor: Farshid Zabihian Gasifier Based Internal Combustion Engine Automobiles account for over 15% of the carbon dioxide pollution into the air each year, which has forced automakers to design more efficient engines for everyday use. Not only are these engines harmful to the environment but they consume a large amount of gasoline each year which is a nonrenewable resource that will eventually become more scarce as the years progress. We believe that there are more efficient ways to use the engines that are seen in cars today by using natural solid renewable resources as our fuel in a system known as 'wood gasification.' This system was developed in the late 1800's and used heavily in Europe during World War II due to a petroleum shortage. In this research, we combined a FEMA style Stratified Downdraft wood gasification system to a 16 HP riding lawnmower which is fueled only from the gasification system. The process of the wood gasification system begins with wood burning inside of a downdraft style fire-tube that pulls the flame down and only allows enough oxygen to start the combustion process, but not enough to complete the reaction. The gases that emerge from the burning wood with an insufficient amount of oxygen are known as a syngas that consists of approximately 20% hydrogen, 20% carbon monoxide, 50-60% nitrogen and a small amount of methane. However there is a downside to burning wood with an insufficient amount of oxygen. This problem results in a 'dirty' gas that consists of ash, sulfur, and moisture which can be harmful to an internal combustion engine after a long period of time. In order to clean the syn gas and reduce the impurities, we have constructed two filtration systems, one of which is a water filter and the other being a dry filter. The dry filter will help reduce the moisture content of the gas before entering the carburetor of the engine, which is where the gas will be pulled into the combustion chamber and used as an alternative fuel for gasoline. At the end of our research, we are hoping to gain a better understanding of the way a gasification system works and develop a gasifier design that can be used in a full sized automobile.

#### 40. Characteristics of Victims of Intimate Partner Violence

### **Stacy Fooce**

Marshall University Psychology Advisor: Marc Lindberg

In West Virginia, nearly 15,000 cases of intimate partner violence (IPV) were reported to the West Virginia Family Court, and one in four West Virginian women have been the victim of severe physical IPV, (Rosser 2012). Moreover, 1/3 of homicides in West Virginia are related to domestic violence, (Rosser 2012). The purpose of the present investigation was to test what things best predict developmental precursors to becoming a victim of IPV. If one can better understand what makes one develop into a victim, then it was reasoned that we could use this information to better treat individuals suffering from this kind of abuse. We predicted that individuals who experience adverse childhood experiences, have poor peer support group, experience partner addiction, have mixed and ambivalent partner attachments, jealousy, and are emotionally abusive themselves, would be correlate significantly with IPV. College students (N=491) completed the following battery of instruments on two different days of testing one week apart in this IRB approved research:

The Attachment and Clinical Issues Questionnaire (ACIQ) (Lindberg & Thomas, 2011), the Revised Conflict Tactic Scale (CTS) (Straus, Boney-McCoy& Sugarman 1996), and the Adverse Childhood Experiences questionnaire (Felitti et al., 1998). The hypothesis were all supported with significant correlations between physical abuse and the ACE, r (N=448) = .20, p < .001, the Peer Support scale r (N=463) = .19, p < .001. Partner addiction r (N=442) = .54, p < .001, mixed partner attachments r (N=458) = .33, p < .001, jealousy r (N=443) = .19. p < .001, partner emotional abuse r (N=463) = .22, p < .001, and ambivalent attachment to partner r (N=439) = .42, p < .001. Conclusions and Implications. First, it must be emphasized that one should not use these results to blame victims as no one ever deserves this kind of abuse. However, the present results suggest to the clinician the many issues found here such as jealousy, partner addiction, lack of a peer support group, mixed partner attachments, ambivalent attachments to partner, and being abusive themselves all need to be dealt with when approaching these difficult issues. Partner abuse is therefore not just as simple as dealing with the perpetrator alone, and we need to provide support and therapy for the victim so that we can help them overcome psychological problems and patterns of re-victimization.

# 41. Erythrocyte invasion by Francisella tularensis increases colonization of Amblyomma americanum ticks

#### **Matthew Ford and Deanna Schmitt**

West Liberty State College Biology Advisor: Joseph Horzempa

Francisella tularensis is a highly infectious bacterium that causes the severe disease tularemia. Humans acquire tularemia through inhalation, oropharyngeal exposure, or tick bites. A unique feature of F. tularensis is its ability to invade erythrocytes. Recent studies from our laboratory have indicated that residing within an erythrocyte enhances the colonization of Ixodes scapularis ticks. Enhanced tick colonization could presumably lead to increased transmission of disease. The focus of this study was to determine whether residing within an erythrocyte also enhanced colonization of a more prevalent tick vector of tularemia, Amblyomma americanum. To test this, capillary feeding was used to deliver intact erythrocytes containing intracellular F. tularensis, or bacteria that had been liberated from red blood cells to A. americanum adult ticks. Here we show that as in I. scapularis, erythrocyte invasion enhances colonization of A. americanum ticks.

# 42. Inhibition of ZEB expression in breast cancer cells suppresses EMT and blocks metastasis.

#### **James Fugett**

West Virginia University Biology Advisor: Alexey Ivanov According to the American Cancer Society, 1 of 2 people will develop cancer over the course of their lifetime. Cancer affects many organs and evolves over time from small and localized to large and spreading (metastasizing) to other parts of the body. The most common human cancers (85% of cases) are of an epithelial origin, which affect such organs as lungs, breast, colon, prostate, liver and others. Epithelial cells are stationary and form tight layers that line the organs of the body, including the ducts and lobules of the breast. In contrast, mesenchymal cells like fibroblasts can move around in the tissue and migrate during wound healing. During development, cells can transition between the epithelial and mesenchymal states to build up complex multi-tissue organs. This process is known as the epithelial-mesenchymal transition (EMT). Confined mainly to embryogenesis, the EMT program can be re-activated in epithelial cancers and is believed to be responsible for spreading of cancer cells to other organs in the process of metastasis. Most cancer deaths are due to metastasis. Therefore, understanding the mechanisms of EMT during metastasis would allow for better cancer treatment in the future. The EMT program can be activated by several transcription factors, including Snail and ZEB, which suppress the expression of numerous epithelial genes such as E-cadherin, cytokeratins and claudins among others. In this study, we sought to conditionally down-regulate Snail and ZEB genes in breast cancer cells which have undergone EMT and became highly invasive and metastatic. We found that knockdown of Snails had modest effect, while inhibition of ZEBs resulted in a complete reversal of cells to their original epithelial state. When these cells were injected into immunocompromised mice, they formed tumors  $\sim 40\%$  smaller in size compared to the control group. Moreover, the number of lung metastases was decreased more than 100-fold in mice bearing ZEB knockdown tumors, indicating that suppression of ZEBs can block metastatic spreading. Interestingly, the metastases were blocked in mice when ZEB knockdown was induced after the tumors were formed, suggesting that anti-ZEB therapy could potentially be beneficial even in patients with preexisting metastases.

# 43. Protein Labeling Methods to Study Temperature Effects on IGF-I Delivery to Growing Mouse Bones

#### Miles Gray

Marshall University Biology

Advisor: Maria Serrat

Our lab studies temperature effects on limb length and molecular delivery to growing bones in the skeleton. A primary goal is to create cost effective methods for stimulating extremity growth with noninvasive techniques. Work that I have helped conduct has shown that limb bones grow longer at warmer temperatures, but the underlying mechanism is not known. The lab has shown that there is greater diffusion of molecules to mouse limb bones at higher temperatures than at lower temperatures. Insulin-like growth factor (IGF)-I is the major circulating hormone required for growth. The focus of our current study is to determine whether warm temperature increases limb length by augmenting delivery of IGF-I to elongating bones. We hypothesize that localized heat treatment will increase the rate of blood circulation to deliver growth-essential factors such as IGF-I to the limbs of developing mice. To test this, we use fluorescent protein

labeling to track the rate at which IGF-I is delivered to the bones at varying temperatures. Our lab established a protocol for adding a fluorescent tag to IGF-I so that it can be visualized in a live mouse. The methods use a reactive dye (Alexa-488) that binds nonspecifically to purified proteins. Thin layer chromatography (TLC), performed as part of my Capstone Research, is used to test whether all of the fluorescent dye is bound to the protein and that there is no free dye left in the sample. Removal of free (unbound) dye is important to confirm that the fluorescence in the bone is only dye-conjugated protein. Here, we present our methods for fluorescent protein labeling and validation using TLC. We performed a bioactivity test (N=6 replicates) and found that the dye-conjugated protein is biologically active. TLC confirmed that all free dye was removed from the sample. These results are significant because they validate methods for studying transport of functional IGF-I into growing limbs of mice at different temperatures. This research is relevant for the treatment of limb length discrepancies in children. Existing treatments usually require surgical intervention, which is often painful with a prolonged recovery. Our work may help reveal non-invasive and inexpensive alternatives using temperature to augment molecular delivery to growing bones without surgery.

# 44. Synthesizing Triesterified Monosaccharides for Trialing in Protected Culture Pest Control

# Megan Guetzloff and Hannah Cavender

West Virginia State University Chemistry

Advisor: Micheal Fultz

Protected culture production of most crops including tomatoes use biological controls as a part of their integrated pest management (IPM) program. Thus, it is important to assess any changes in the production system and how they will affect the IPM system being used before implementation. Breeding acyl-sugar mediated resistance into tomato varieties for the protected culture system offers the potential to control whiteflies and aphids, two of the top insect pests. However, no research has assessed these compounds effect on biological control agents used. Acyl-sugars could prove to be an environmentally friendlier alternative to harsh pesticides, so optimizing their natural production would be ideal. Our first step of this project has been to synthesize specific acyl-sugars in order to ultimately be able to test their effects on beneficial insects and biological controls in the greenhouse. The target compound was investigated from a retrosynthetic perspective, which allowed for the development of a synthetic route. In retrosynthesis, a synthetic route is created from starting at the end and working towards the beginning. The target compound had positions 2.3, and 4 esterified. In order to selectively add these acyl chains, the anomeric and primary positions had to be protected first. Once these positions are blocked, the acyl chains can be added with ease. The last two steps are then to remove the protecting groups, which yields the final product.

### 45. Community Research through Teen Implementation

# Rebecca Hagedorn

West Virginia University Sociology

Advisor: Melissa Olfert

Community-based participatory research (CBPR) is a collective approach between researchers and community stakeholders that engages the community to become involved in research. The goal of CBPR is to influence quality of life in the community. The partnership utilized by CBPR is a key factor in developing successful interventions that can be easily implemented into the community. The Health Sciences Technology Academy (HSTA) in West Virginia (WV) is ideal for CBPR. HSTA is a West Virginia University sciencebased program that gives students from underrepresented families a chance to attend college. Through this program, the students participate in research and are encouraged to pass on this knowledge to the population. For this reason, HSTA and CBPR are highly compatible. By using the HSTA program as a way to implement research, more research opportunities in WV become available, especially among high school students. Therefore, the purpose of this study was to implement an ongoing research intervention, the iCook 4-H childhood obesity prevention, into local high schools in order to initiate CBPR into the HSTA program Community Research Associates for HSTA met with the Principal Investigator of the WV iCook intervention program to see if implementing iCook into high schools was feasible. HSTA leaders and researchers approved the implementation. In the summer of 2014, HSTA teachers underwent training on the recruitment and curriculum of iCook. A WV urban high school was the first school take on the program after meeting with WVU researchers at the HSTA club meeting in August. Students started recruitment in the communities resulting in dyad teams (youth and adult pairs) being recruited. HSTA students were trained on delivery of the curriculum by HTSA teachers with minimum assistance from WVU researchers. The iCook classes started in October and took place biweekly with students using the off week to prepare for the following week's class. Fidelity, a measurement on how accurately the program is being delivered from what is intended, was tracked by WVU graduate researchers insuring HSTA will be able to deliver the curriculum comprehensively as it was intended. CBPR is advantageous in disseminating research projects into the community. HTSA is a great opportunity to easily and efficiently take this groundbreaking research into the community in West Virginia. In summary, using HSTA as an avenue for CBPR gives students valuable research experience by participating in well-established research program, while also making a positive change in the community around them.

### 46. Design of Inertial Navigation System for Planetary Rover

#### **Scott Harper**

West Virginia University Engineering Advisor: Yu Gu In June of 2014, West Virginia University competed in the NASA Sample Return Robot Centennial Challenge for the first time and was the only contender to successfully complete stage 1 of the 2 stage challenge, a feat that has only been achieved once before. The Sample Return Robot must follow a strict set of rules that have been developed to inspire new innovations to overcome a variety of obstacles that is commonly encountered in the exploration of celestial bodies. Major requirements include: full autonomy, navigation without the use of earth based technologies, and the retrieval of desired samples. By claiming this victory, our team has been given the chance to compete for the \$1.5M stage 2 prize in 2015. The objective in stage 1 was to collect a single 'pre-cached' sample, given the sample location and the location/orientation that the robot will start, within a 30 minute time period. In stage 2 the challenge is greatly increased in difficulty, due to not knowing the robots starting orientation, creating the need for improvements to the current navigation system and localization capabilities. Due to the restriction of the competition, typical navigation systems that utilize GPS are not an option. To counter this, our team took advantage of what is known as an ultra-wide band ranging radio (UWB). In the 2014 competition, our team used these devices to determine the distance and bearing of the rover in relation to the starting platform. However, these UWB measurements are very slow, and not always fully reliable. To compensate in the short run, the rover relies heavily on our Inertial Navigation System (INS). The INS is very precise in short increments for determining pose, but will drift over time if not corrected. The current rover utilizes a Printed Circuit Board (PCB) known as the 'Quad-IMU Board' to receive data from 4 Inertial Measurement Units (IMUs), which is the backbone of the INS. For stage 2, which has many more unknown variables, the INS system will be expanded from the current 4 IMU configuration to an 8 IMU system. By increasing the number of IMUs, the long-term drift in error is reduced. The data being produced by these IMUs will allow for a process called 'Gyro Compassing', which senses the rotation of the earth to determine the location of the Earth's poles to overcome initial localization in a random orientation.

# 47. Using Likelihood Ratios for Source Attribution of Glock™ Model 21 Fired Cartridge Cases

#### **Catherine Hefner**

West Virginia University Engineering Advisor: Keith Morris

There has been limited research using a statistical method to determine source attribution of cartridge cases. The National Academy of Sciences (2009) stated that firearm examiners are criticized due to the purported inconsistency when drawing conclusions. This study determined the effectiveness of using likelihood ratios to evaluate the accuracy of source attribution using Integrated Ballistic Identification System<sup>®</sup> (IBIS) (Ultra Electronics Forensic Technology<sup>®</sup> (UEFT)) scores. This research hypothesized that this method will: (a) provide a statistical basis for firearm evidence interpretation and (b) increase reliability and validity of determining source attributions. A quantitative correlational study design was used to examine impression evidence on cartridge cases fired by various Glock™ pistols (Glock, Inc.®). RStudio® and R® (R-Tools Technology Inc.®), were used to process

the data, and Netica™ (Norsys Software Corp.) was used to generate a Bayesian network. Such networks intrinsically incorporate likelihood ratios in the odds form of Bayes' Theorem.

*Keywords:* IBIS®, Glock™ pistol, likelihood ratio, Bayesian network, Bayes' Theorem, firearm, breech face, firing pin

Committee on identifying the needs of the forensic science community, national research council. (2009). Strengthening forensic science in the United States: A path forward. National Academy of Sciences.

### 48. Microbial Testing of Water Quality near Marcellus Shale Drilling

#### **Devin Heitz**

Fairmont State University Biology Advisor: Mark Flood

In recent years the integrity of water quality near Marcellus drill sites has been questioned. Water samples that contained microbes were taken from various sites (all in the vicinity of Marcellus drilling area) so that testing on the variation and density of the bacterial organisms could be measured. The purpose for this is to test the effects the Marcellus sites are having on nearby streams and rivers. Testing the water chemistry as well as the microbes will in fact shed light on whether the drilling is having adverse effects on water quality. It is speculated that water samples collected will have an array of different bacteria that thrive on water that is poor in quality and lack organisms that appear in sanitary waters. The increase or decrease in certain bacterial communities will indicate either high quality or contaminated water.

#### 49. MAXIMIZING LIPID PRODUCTION IN CHLORELLA VULGARUS

#### **Aaron Holland**

Marshall University Chemistry Advisor: Derrick Kolling

Marshall University, Department of Chemistry, 490 Science Hall, Huntington, WV 25755, USA With the depletion of available fossil fuels and rising demand, an alternative source of energy will eventually be a necessity. A popular alternative is corn-based ethanol but the inherent problem with this solution is competition with food crops for agricultural space. In comparison, microalgae would only use 2.5% of existing U.S. cropping area to provide the nation with 50% of its energy needs. Although microalgal fuels are advantageous in terms of agricultural space it is still more expensive to produce biodiesel than traditional petroleum fuels. In an effort to make biodiesel more cost efficient, cultures of the algal species Chlorella vulgaris were grown in nitrogen-deplete medium in the presence of glycerol in an effort to maximize lipid production in the cells. To track the growth of the

cells and the lipid accumulation, turbidity, dry weight, lipid extractions and chlorophyll a levels were measured daily. Cultures grown in nitrogen-deplete medium with glycerol were observed to have stunted cell growth compared to the control group which was grown in CV+ medium. The difference in growth at the end of the exponential phase between the cultures was approximately 32%. Another notable attribute among the nitrogen-deplete with glycerol cultures was that the concentration of chlorophyll a dropped from 5.5  $\pm$ g/mL at the end of the exponential phase to 0.75  $\pm$ g/mL by the end of stationary growth. The control cells on the other hand remained approximately at  $\pm$ g/mL. The results also showed that the nitrogen deplete with glycerol cultures had an average lipid concentration of approximately 24% per cell, while the control group only had 11% per cell.

### 50. Application of Vertical Axis Wind Turbines in West Virginia

# **Tavon Johnson and Alex Perry**

West Virginia Institute of Technology Engineering Advisor: Farshid Zabihian

This project was initiated to study the effects of West Virginia's topography on wind energy and how Vertical Axis Wind Turbine (VAWT) could be utilized to harness energy that may otherwise be lost by conventional Horizontal Axis Wind Turbine (HAWT) designs. This would cut down West Virginia's dependence on non-renewable energy, and create a path to a sustainable energy for the future of the state. As fossil fuels continue to be regulated and reduced, sustainable green energy will be key to the future of the state. The study was conducted by examining topographic maps and wind direction maps effects on vertical axis wind turbines. By observing the direction that wind flows in West Virginia, it was easy to see why conventional turbines could not be used in majority of West Virginia's counties. It was apparent that the most powerful wind is found along the eastern border of West Virginia. At a higher elevation wind becomes very turbulent, which is mainly due to the wind deflecting off of higher mountain peaks to the east. Because of the design of the VAWT, its rotors can receive wind energy from any direction; this makes it good for mountainous regions. Currently we are preparing to conduct experimental research on a VAWT. This exploration will include the purchase and installation of a VAWT at West Virginia University Institute of Technology (WVU Tech). Located in Montgomery, West Virginia, WVU Tech is a perfect location for research, as it is an area with many wind obstructions, such as buildings and mountains. The effects of the rough topography on the turbine will be studied in great detail. Additionally, we plan to install a weather station to collect weather data and wind speed measurements for our analysis. The VAWT will be a small Savonious type design. This turbine will be compared with the currently existing HAWT that has been installed on the engineering building.

### 51. Automatic Classification of Neuron Morphology by Age or Type

### **Quinn Jones**

West Virginia University Computer Sciences Advisor: Doretto Gianfranco

Neuron cells are typically classified by their age or type, each can be identified by cell morphology. Knowing the class of a cell can predict its attributes and behavior in the neural circuit. The ability to automatically classify cells will increase throughput in anticipation of an increase in the availability of cell model data due to President Obama's BRAIN initiative. We used the bag of keypoints method for classifying images which we are extending by using spin-images, a technique from surface mesh recognition to create an invariant descriptor of the local cell morphology. We modified the normal method by reducing the amount of spin-images and reducing the size of the spin-images to isolate local features. The spin-images are clustered using kmeans to find the number of features on the cells. A support vector machine classifies the cells based on having similar number of features. Validation was done using leave one out and 3-fold validation. With only 36 cell models for training data we achieved an 86% accuracy rate of classification.

### 52. Omega-3 fatty acids and soy protein promote fatty liver in polycystic liver disease

#### **Sundus Lateef**

West Virginia University Biology Advisor: Janet Tou

Polycystic kidney disease (PKD) is a leading genetic cause of end stage renal failure and the 4th most common cause of chronic kidney disease in West Virginia. Polycystic kidney disease often requires dialysis and transplantation in its later stages and affects 1 in 500 to 1.000 West Virginians. Also known as infantile PKD, autosomal recessive polycystic kidney disease (ARPKD) has a mortality rate of nearly 30% immediately following birth and results in high morbidity and mortality beyond the neonatal period due to polycystic liver disease (PCLD). No effective medications exist for PCLD. Therefore, this study investigated the therapeutic potential of diet rich in anti-inflammatory omega-3 polyunsaturated fatty acids (n-3 PUFAs) and anti-estrogenic soy protein isolate (SPI) in attenuating the severity of PCLD. This diet has been shown to attenuate the severity of cyst formation and inflammation in PKD. Furthermore, diet is a potentially ideal therapeutic agent that is effective at the disease site, alleviates disease-related complications, and produces minimal side-effects. In a female polycystic kidney disease rat model, diet rich in SPI and n-3 PUFAs led to the unexpected development of fatty liver and liver inflammation and fibrosis. To identify the cause of this complication, liver tissue was analyzed using real time quantitative polymerase chain reactions for gene expression of lipogenesis and lipolysis. Because enzymes (SREBP-1c, p=0.38; PPAR', p=0.48) and transcription factors (SCD-1, p=0.15; FAS, p=0.28) were not up-regulated, we eliminated abnormal fat metabolism as the cause of fatty liver. Therefore, the probable mechanism of disease was decreased lipid

circulation due to cystic blockages of outflow and in flow. Based on these findings, further research on dosage and timing of diet is necessary to develop appropriate therapies for incurable genetic diseases such as PCLD and ARPKD. The potential for widely accepted dietary supplements like omega-3 PUFAs to worsen the diseased state must be investigated to avoid serious complications.

### 53. Disgust Sensitivity, Prejudice, and Stereotypes: A Mediation Model

#### **Brandy Ledesma**

West Virginia University Psychology Advisor: Natalie Shook

The emotion of disgust evolved to protect individuals from consuming potentially harmful objects that could cause illness or infection (e.g., rotten food; Schaller & Duncan, 2007). Beyond oral contaminants, disgust is also evoked by bodily products (e.g., blood, feces), as well as other people (Hodson et al., 2013). Evolutionarily, a primary source of disease transmission was other humans, particularly outgroup members who may have carried foreign pathogens (Hodson, et al., 2013). Thus, individuals may have developed a disgust response to outgroup members as a disease avoidance mechanism. Indeed, disgust sensitivity is associated with prejudicial attitudes toward sexual minorities (i.e., homosexuals and bisexuals) and obese individuals (Inbar, Pizarro, Knobe, & Bloom, 2009; Liberman, Tybur, & Latner, 2012; Terrizzi, Shook, & Ventis, 2010, 2012). However, less is known about whether disgust sensitivity is associated with stereotypes. This study examined the relations among disgust sensitivity, prejudice, and stereotypes toward different racial groups. It was hypothesized that individuals higher in disgust sensitivity would report more prejudiced attitudes and, thus, endorse more stereotypes. Prejudice was conceptualized as a mediator between disgust sensitivity and endorsement of stereotypes. Participants were recruited through Amazon's Mechanical Turk and they completed an online survey containing mekoepke asures of disgust sensitivity, stereotypical beliefs, and prejudice toward different racial groups. Data will be analyzed through bivariate correlation analyses.

# 54. *Cambarus bartonii bartonii* (Common Crayfish) in Virginia's James River basin: one species or two?

#### **Daniel Lukich**

West Liberty State College Biology Advisor: Zachary Loughman

The distribution of *Cambarus bartonii bartonii* (Common crayfish) is broader than that of any other North American crayfish. It encompasses stream ecosystems from Canada to Georgia (Cordeiro et al., 2010). In this study, a Virginian population of *C. bartonii* with a characteristic red and reticulated phenotype (dubbed "Virginia A") was analyzed to

determine if sufficient morphological difference existed between it and type populations to elevate it to full species status. Twelve morphometric measurements from males (Form I) were compared between both populations to determine if phylogeographic distinctiveness existed between these two groups. Univariate and multivariate analyses of these variables did not show significant morphological difference between Virginia A and the type population. Thus, a phylogenetic approach is recommended for determining if taxonomic definition is appropriate for the Virginia A population.

# 55. Interactions between SO2 and Fly Ash Components for Oxycombustion Conditions

#### **Robert MacDonald**

West Virginia University/University of South Carolina Engineering

Advisor: Bihter Padak

Interactions between SO2 and Fly Ash Components for Oxycombustion Conditions Robert Alexander MacDonald West Virginia University Advisor: Dr. Bihter Padak combustion, the flue gas from a coal power plant is primarily a mixture of water, nitrogen, and carbon dioxide. Oxy-combustion that utilizes combustion under oxygen and carbon dioxide (CO2) results in a highly concentrated stream of CO2 that can be sequestered before it enters the atmosphere. This is due to the flue gas lacking nitrogen, and the ease of condensing water from the gas stream. In oxy-combustion the lack of nitrogen causes oxygen to have a higher partial pressure, which oxidizes more sulfur dioxide (SO2) to sulfur trioxide (SO3) than in air combustion. The SO3 reacts with water to form sulfuric acid causing corrosion. The higher amount of SO3 results in higher sulfur retention on the fly ash, but the mechanism of sulfur binding is not well understood. In this study, calcium oxide (CaO) and magnesium oxide's (MgO) ability to adsorb SOx was examined under different temperatures and exposure times to SO2 in air. The samples were characterized using Fourier transform infrared spectroscopy, x-ray diffraction, and a scanning electron microscope. The results so far have indicated that MgO has a lesser binding ability relative to CaO, this is partially due to the lower binding energy between MgO and SO2.

### 56. BioNano Enzyme Conjugates for Efficient Bacterial Decontamination of Surfaces

#### **Andrew Maloney**

West Virginia University Engineering Advisor: Cerasela Dinu

Outbreak of severe infections due to unsuccessful decontamination of surfaces could affect both civilians and infrastructures thus leading to unfavorable socio-economic impacts. The development of the next generation of decontaminants needs to account for reduction of the logistical burdens associated with infection prevention when harsh chemical reagents are employed and should aim to use green-based technologies with minimum impact on the user and the environment. In this work, we seek to create environmentally-friendly,

self-sufficient, self-cleaning, enzymatic decontamination platforms that encapsulate bionano catalytic conjugates to prevent infectious outbreaks. Our technology uses two enzymes, namely glucose oxidase and chloroperoxidase, attached to a nanosupport to generate a potent decontaminant, hypochlorus acid (HOCl). The mechanisms of HOCl generation as well as the conditions that ensure enzyme immobilization, activity and maximum stability at the nanosupports, are investigated to determine the optimum circumstances that lead to maximum catalytic behavior at the nanointerfaces. The optimization is reported in terms of conjugates ability to efficiently decontaminate bacteria such as E. Coli. Implementation of such a technique could lead to self-sustainable catalytic interfaces with advanced decontamination capability and large consumer applications.

#### 57. WV FoodLink

# Amanda Marple, Dillion Muhly-Alexander

West Virginia University Geography Advisor: Bradley Wilson

Over the past decade demand for emergency food assistance in West Virginia has grown tremendously as household budgets shrink and families try to close the food gap. This changing demand raises critical problems for emergency food providers. How will they respond to the changing landscape of food insecurity in the region? WVFOODLINK is a research initiative to enhance the strength of emergency food networks within West Virginia. Leveraging expertise in social science and geospatial research, our geographic research team developed an interactive, web-based map that provides critical information about emergency food assistance in the state. The online WV FOODLINK Atlas allows users to easily search and find the location of emergency food providers such as food banks, food pantries, meal programs, school lunch and backpack programs, SNAP approved retailers as well as state and federal resources for struggling families. Mapping the new and ever changing terrain of emergency food assistance in West Virginia is vital to enhance communication, planning, and innovation within the state-wide community food security network. In our presentation we will present findings from our mapping analysis and walk policy-makers through the features of the WVFOODLINK Atlas.

# 58. Determining the Subcellular Localization of a Novel Transcription Factor Using a Green Fluorescence Protein Vector

#### Kristen Mastrantoni, Jacqelyn Hand and Lei Wang

West Virginia University Biology

Advisor: Jianbo Yao

Zinc finger transcription factors (ZNF) containing the Kruppel associated box (KRAB-ZNF) constitute one of the largest protein super-families encoded by the genomes of eukaryotic organisms. ZNFs function in the cell as regulators of transcriptional activity. In this experiment, the subcellular localization of a novel ZNF (ZNFO), specific to the mammalian

oocyte and found to be associated with embryonic genome activation, was studied by fusing ZNFO to a green fluorescence protein (GFP). The objective of the study was to determine the cellular compartment in which ZNFO is localized in order to confirm its function as a transcriptional regulator. Molecular cloning techniques were used to introduce the coding region of ZNFO, as well as a truncated form of the gene, into a green fluorescence vector, pEGFP. The resulting clones were then used in the transfection of a mammalian cell line (HEK293) and observed using fluorescent microscopy. Consistent with the predicted subcellular localization of this novel zinc finger protein, ZNFO was found to be exclusively localized to the nucleus supporting its role to target DNA and regulate transcription. Based on previous studies, it is suspected that this novel protein may be a key regulator of embryonic genome activation. Insight into the biological function of this novel ZNF may enable its use as a biomarker to predict early embryonic loss.

# 59. Investigation on Reactions of Uranyl (UO22+) with Various Reducing Agents by UV-Vis and EPR Spectroscopies

### Hajer Mazagri

University of Charleston Chemistry Advisor: Xiaoping Sun

Previous spectroscopic characterization of the uranyl U022+ ion in common acids, such as sulfuric, nitric, acetic, and hydrochloric acids, has revealed distinct properties of the excited state of UO22+in a given acid due to the unique interactions of the ion and the acid molecules. In this research, the uranyl UO22+ ion was characterized by UV-Vis spectroscopy in diversified concentrations of reducing agents in an aqueous media and varying concentrations of sulfuric acid. These media included NaBr (aq), KI (aq), NaBr'H2SO4 (aq), and KI'H2SO4 (aq) solutions, as well as the non-aqueous C6H5OH'CH3OH and C6H5OH'CH3OH'H2SO4 mixtures. In general, the electronic absorption spectra of UO22+ in the above-mentioned media exhibited well-resolved vibronic structure in the lower energy side due to interactions of the I- and Br- anions with UO22+. The vibronic structure of UO22+ was distinct in each different medium. By the addition of H2SO4, an observed increase of the charge-transfer transition in the lower energy side (a shoulder of the spectra). This trend was also observed as the concentration of H2SO4 was increased. However, the addition of varying concentrations of H2SO4 to the C6H5OH'CH3OH mixtures caused a decrease in the charge-transfer transition compared to the original sample without the H2SO4. The charge-transfer oxidation-reduction has also been characterized by electron paramagnetic resonance (EPR) spectroscopy. The uranyl ion exhibits remarkable oxidation-reduction properties. The results obtained in this research will facilitate further development of the redox chemistry of UO22+. Among other things, this will find substantial applications in the disposal and isolation of uranium nuclear waste by precipitation of the reduced uranium.

### **60. The Effects of Parenting Styles on Personality Development**

### Nasiyra McCorkle and Emma Nellahus

West Virginia State University Psychology

Advisor: Paula McCoy

Parents, and their parenting styles, are the first influence on a child's personality development (Maddahi, Javidi, Samadzadeh, and Armini, 2012). This study explores the relationship between parenting styles and the development of conscientiousness in college freshmen in Appalachia. The Parental Authority Questionnaire (Buri,1991) and the Perception of Parents Scale (Robbins, 1994) will be used to assess parenting styles, The International Personality Item Pool 'NEO, short form (Johnson, 2011) will be used to assess Conscientiousness. Previous research has suggested which parenting style produces the best results with respect to personality and other outcomes is culture-dependent'in Western cultures, the authoritative parenting style produces more favorable results and in Eastern cultures, the authoritarian parenting style produces more favorable results (Leung, K. Lau, S., and Lim, W., 1982). Our hypothesis is that the authoritative parenting style will produce higher scores on Conscientiousness in the current group, but there will be a higher incidence of authoritarian parenting styles as a function of beliefs and practices regarding child-rearing in Appalachia.

# 61. The Application of Au Dendrimer Encapsulated Nanoparticles for Sensitive microRNA Detection

# Marjorie McCoy and Philip Kirk

Marshall University Chemistry Advisor: Scott Day

MicroRNA is a relatively new discovery within the human body. It is highly specific to different types of tissue, including diseased tissues such as cancers. This research focuses on developing a sensor for detecting microRNA in complex fluids with downstream applications for a relatively simple form of diagnostic technology which could be useful in medically under served areas. MicroRNA will be extracted from complex solution using complementary DNA attached to magnetic beads and their presence detected through the catalytic reduction of p-Nitrophenol by Au dendrimer encapsulated nanoparticles (DENs). Our current research involves linking the Au DENs to DNA and testing the catalytic activity for signal amplification. We have confirmed the conjugation of the capture DNA to the Au DENs and are currently measuring the catalytic activity of the Au DENs in the presence of the linked DNA.

#### 62. Avoidance of Dental Care is associated with a General Sensitivity to Anxiety

### Kayla McLaughlin

West Virginia University Psychology

Advisor: Daniel McNeil

Dental avoidance and dental phobia are widespread, significant public health problems resulting 5-10% of adults in the USA to avoid necessary care. Often, these fearful adults fall into a 'cycle of avoidance,' wherein they seek dental care only on an emergent basis, when treatment is most likely to be invasive, further reinforcing the image of dentistry as painful and to be avoided. As a result, high dental fear individuals have poorer oral health and oral health quality of life than those who are less fearful. The literature supports a strong relation between oral health and health in general. Of particular interest is the role that dental care-related fear and anxiety have in leading to poor oral health. Research indicates that, due to avoidance, many fearful patients do not get timely dental care. This study focused on exploring the psychological factors associated with dental fear and avoidance. It was hypothesized that a greater proclivity to anxiety (i.e., anxiety sensitivity) would be associated with higher dental care-related fear. Participants (n = 53; 24 female), ages 21 - 64 years (M = 37.6, SD = 14.4), were community-dwellers taking part in the protocol for a study of distress tolerance and dental phobia at West Virginia University. These individuals completed the Dental Fear Survey, Dental Fear Interview, and Anxiety Disorders Interview Schedule' IV in order to confirm diagnosis of dental phobia and distinguish between the experimental group and healthy control. Participants were then administered the Anxiety Sensitivity Index-3 and comparisons made between groups. Controlling for age, income, and education, anxiety sensitivity was a significant difference between the experimental (M = 30.9; SD = 10.3) and the control (M = 7.1; SD = 5.7) groups: t(41.51) = 4.4; p < .005. Greater levels of anxiety sensitivity were associated with greater dental care-related fear and anxiety scores present in the experimental group. As hypothesized, anxiety sensitivity is significantly correlated with dental care-related fear in this Appalachian sample. This study proposes a potentially important area for future research in identifying predictive features of dental anxiety. As the literature demonstrates the adverse effects of dental anxiety on oral health outcomes, these findings are important. In considering behavioral interventions for dental care-related fear and anxiety, anxiety sensitivity may be a relevant factor.

#### 63. Shapiro Delay of Pulsar J1640+2224

# Natasha McMann and Joris Verbiest

West Virginia University Astronomy

Advisor: Maura McLaughlin

Pulsar J1640+2224 is a binary millisecond pulsar with a white dwarf companion and is included in pulsar timing arrays that are currently being used in experiments to detect gravitational waves. A previous study of the system's Shapiro Delay by Lîhmer et al, 2005

constrained the companion mass to m2 =0.15+0.08 -0.05Msolar which would imply an unprecedentedly low pulsar mass. We improved their result by analyzing pulsar timing data from four different radio telescopes: the Effelsberg 100m radio telescope in Germany, the Westerbork Synthesis Radio Telescope in the Netherlands, the Nanáay radio telescope in France, and the Lovell radio telescope at Jodrell Bank in the United Kingdom. Our study constrains the companion mass to m2=0.28+0.35-0.03Msolar and the pulsar mass to m1=1.51+3.30-0.22Msolar. The relatively wide orbit in which this pulsar resides (period  $\sim$ 6 months) complicates this analysis as it introduces covariances with the Earth's motion. Continued monitoring should therefore allow further improvements to this mass measurement.

# 64. DISAPPEARING ACT: HOW RECORDS OF ANCIENT EARTHQUAKES CAN VANISH INTO THICK ROCKS

#### **Matthew Merson**

Concord University Geology/Earth Science Advisor: Joseph Allen

All known rocks on planet earth can be classified as one of three types 'igneous, metamorphic, or sedimentary. The majority of rocks exposed on the surface, including in West Virginia, are sedimentary rocks. It is within these sedimentary rocks that fossil fuels are found and extracted. Underlying the sedimentary layers are igneous and metamorphic rocks, known as basement rocks. Faults can be found within these rocks, and though they may not be presently active, they have the potential to reactivate and disrupt the overlying sedimentary layers as well as change the geometry and distribution of petroleum and natural gas reservoirs. In West Virginia, the average depth to basement rocks is 30,000 feet below the surface. Due to the nature and composition of basement rocks, the physical conditions associated with earthquakes can be recorded and preserved within them. This record of movement along faults at depth is preserved in a rock known as pseudotachylyte. Pseudotachylyte, a rock formed as a result of a single earthquake, originates from the large frictional forces that are generated as massive bodies of rock move past one another. Typically, pseudotachylyte is formed 10-15 kilometers deep, but some have been reported from greater depths. Normally, if pseudotachylyte is generated at a depth greater than 15 kilometers, it becomes overprinted through metamorphism and other geological processes, and is removed from the rock record. In order to further investigate the evolution of basement-rock earthquakes and their products, we collected field data and samples from the largest mapped area of pseudotachylyte exposed at the surface. Within this field area, known as Homestake Shear Zone, Colorado, we examined extensive exposures of basement rocks that experienced high temperature and pressure metamorphism, and within these rocks, we report the unusual occurrence of metamorphosed pseudotachylyte. Under the microscope and imaged in the electron microprobe, these samples consist of fine-grained crystals of biotite and re-crystallized quartz rather than the opaque glassy matrix typically seen in normal pseudotachylyte. In outcrop, these resemble biotite bands characteristic of the older basement rock; thus they are well camouflaged and have previously remained undiscovered. This presentation will further elaborate on this ongoing work in order to

describe the chemistry and micro-structure of these anomalous rocks as well as discuss models of their probable origin and preservation. This work was funded by grants from the National Science Foundation and the West Virginia Research Trust Fund to Concord University.

# 65. Three-dimensional Microfluidic Co-culture Model of the Bone Marrow Microenvironment for the Study of Acute Lymphoblastic Leukemia

#### Ryan Mezan

West Virginia University Biology

Advisor: Yong Yang

Acute Lymphoblastic Leukemia (ALL) effects almost 200,000 people annually in the United States. This disease starts from white blood cells, called lymphocytes, in the bone marrow and very quickly invades the blood stream and spreads to other areas of the body. Developing swift and effective therapies is essential in treating this rapid developing disease. Current treatments have been based on the principal of testing chemotherapy drugs on traditional cell culture methods. These culturing methods are two-dimensional and cells are cultured on stiff, flat, plastic substrates. This technique fails to account for the complex microenvironment, where the cells interact with their surrounding extracellular matrix (ECM) and neighboring cells. Moreover, the ECM provides mechanical support for cells and influences cell adhesion, migration, proliferation, differentiation, and gene expression. Due to these limitations, the conventional cell culture does not mimic the in vivo scenario. This problem produces a critical need for biomimetic cell culture platforms that more accurately map the natural microenvironment. Therefore, we engineered a three-dimensional (3-D) microfluidic platform to mimic the bone marrow microenvironment for ALL studies.. Biologically relevant populations of primary human derived bone marrow stromal cells (BMSCs), osteoblasts and a human ALL cell line were encapsulated in collagen I gel, commonly found in the ECM, and injected into a microfluidic device with a simulating interstitial flow. With this platform of physiological relevance, we studied the effects of cell-cell and cell-matrix interactions on tumor cell survival in response to anti-cancer drugs. Traditional 2-D co-culture, 3-D static, and 3-D dynamic cultures were evaluated to determine response to a common chemotherapeutic drug, Ara-C. The 3-D co-culture models showed higher survival of tumor cells during Ara-C exposure as well as enhanced protection during chemotherapy stress conferred by microenvironment cells. The engineered 3-D microfluidic co-culture model provides a useful tool to improve our limited comprehension of the role of microenvironmental signals in cancer biology.

#### 66. Portable Medical Search Application

#### Olivia Milam

Marshall University Computer Sciences Advisor: James Day The primary objective of this project was to develop a multiplatform portable app that medical personnel can use as a resource to search for answers to advanced medical questions. The target user group includes physicians, residents, medical students, nurses and any other medical personnel that need reliable and immediate access to medical information. This app allows the user to search several medical texts and suitable websites at once, thus saving time and ensuring that only peer-reviewed websites are referenced. Furthermore, the user can preselect what websites are searched, so the app is capable of being fully customizable to meet the needs of that particular professional. Another advantage of the user selecting the websites is that the search will have the professional's judgment and not return everything semi-relevant. The app also refines the search results, so that the most likely options show up first. This app solves the issue of the medical professional having to spend time logging in to many different databases and textbooks to find the needed information. The outcome of this project was a stable and user-friendly app that meets the needs of medical professionals. The long-term goal of this project is to help medical professionals use their time more efficiently. By having a smarter search and not having to manually login and out of multiple sites, the user will save time researching patient issues. That time could then be spent on other pressing issues. Another outcome would be increased accurateness of information returned in a search. This app will remove the temptation to use Google and other general population search engines that return nonexpert written sources. This will prevent possible issues from inaccurate information.

# 67. Evolution of the deciduous southeastern azaleas (Rhododendron subgenus Pentanthera section Pentanthera)

#### **Tuesday Moats and Kathleen Kron**

Marshall University Biology

Advisor: Emily Gillespie

The genus Rhododendron consists of around 1,000 species of woody plants in the family Ericaceae. The 17 species in section Pentanthera make up some (but not all) of the plants known as azaleas'deciduous, elepidote (lacking scale-like hairs on the leaves) rhododendrons. They are habitat generalists and understory dominant in forests, and they can be found in Asia, North America, and the Caucasus. In this project, molecular data are being collected and used to infer evolutionary relationships within this section; these data are being compared to phylogenetic data generated using morphological, phonological, and chemical data. The genes being analyzed include coding and noncoding regions from both the nuclear and chloroplast genomes. The sequences are being analyzed using four strategies in conjunction with one another: Bayesian Inference, RAxML Maximum Likelihood, PhyML Maximum Likelihood, and Maximum Parsimony. It is expected the phylogeny will closely follow the one predicted, while answering the questions of monophyly and adding to the largely incomplete collection of molecular species data. The work of this project is important to the field of historical biogeography, as well as to the numerous horticultural societies dedicated to knowing the different species of azaleas for the purposes of breeding and selling.

# 68. Does activation of the G-protein linked estrogen receptor, GPER1/GPR30, affect proliferation & viability of brain tumor cells?

### **Ashley Moore**

West Virginia State University **Biology** 

Advisor: Gerald Hankins

Meningioma and glioblastoma are the most common central nervous system tumors. Meningiomas arise from the meninges that cover the brain and spinal cord. Glioblastomas are fatal tumors that arise from astrocytes that form supportive tissue of the brain. While meningioma incidence in women is twice that of men, glioblastoma incidence in men is 1.5 times that of women. Therefore, it is thought that female sex hormones play a role by promoting meningioma tumorigenesis while inhibiting glioblastomas. However, the mechanisms of the hormonal effect on these tumors have not been well elucidated. Recently glioblastomas have been shown to produce and respond to kynurenine, which is produced from the amino acid tryptophan. Kynurenine activates the aryl hydrocarbon receptor (AHR). Promiscuity of ligand binding can result in cross talk between AHR and classical estrogen receptors and both receptor types are known to use the protein p300 as a cofactor. We demonstrated that inhibition of p300 results in reduction of viable CH157-MN meningioma cells in culture. Treatment with '-estradiol or kynurenine partially abrogated this effect, suggesting that both estrogen and kynurenine may act through another receptor. We hypothesize that the G-protein coupled estrogen receptor, GPER1/GPR30, may be responsible for this effect. We found expression of GPER1, AHR, estrogen receptor 'and some forms of estrogen receptor 'in CH157-MN, U87 glioblastoma and A172 glioblastoma cells. The results on abrogation of effects of p300 inhibition in CH157-MN cells were extended to a second AHR activator, TCDD (dioxin), and a GPER1specific activator, G1. We also evaluated effects on U87 and A172 cells. The results for U87 reflected the results for the meningioma cells, except there was no response to kynurenine, perhaps due to the higher level of kynurenine produced by U87 than by CH156-MN cells. None of the activators reduced inhibition of p300 in the A172 cells; this may be due to the very high levels of kynurenine production by A172 (over twice that of U87 and almost 7 times that of CH157-MN). Finally, each cell line was treated with G1 alone or with G1 in combination with specific GPER1 antagonists, G15 and G36. Cells were treated with vehicle (DMSO at 0.1%) as a control. Consistent with the effects of estrogen on glioblastomas, G1 reduced the numbers of viable cells in both glioblastoma cell lines. Both G1 antagonists were able to abrogate this effect in U87 while G36, but not G15 abrogated it in A172.

#### 69. Morphological plasticity of dendrites during early nervous system development

#### **Cody Mullens**

West Virginia University Biology

Advisor: George Spirou

Neural plasticity is a common characteristic in the central nervous system, especially during early development. Cellular structures and organelles such as the nucleus, soma, dendrites, and axon are all subject to change throughout development. Specifically, development of dendrites contributes to proper establishment of neural circuits by determining innervation onto a given neuron. We are analyzing patterns of dendritic growth during early development of the auditory brainstem involving a newly established model system for neural development, the medial nucleus of the trapezoid body (MNTB). As dendrites are involved in wiring of the brain, defects in dendritic growth and formation can cause miswiring of the brain, leading to various neural disorders such as mental retardation and Alzheimer's disease. We have hypothesized that during their dynamic development, dendrites in the MNTB become exuberant in morphological complexity, followed by retraction, and lastly regrowth in order to strengthen the synapse of a single large nerve terminal, signaling resolution of development to the system of interest. To test our hypothesis, we used serial block-face scanning electron microscopy (SBEM) for threedimensional ultrastructural reconstruction of tissue blocks at different ages, encompassing the aforementioned development. SBEM volumes between the ages of postnatal (P) day 2-30 were examined for complexity, branch order, and total number of dendrites. Preliminary data suggests overall support of our initial hypothesis. We plan to expand upon findings by establishing quantitative data for total dendrite length and dendrite diameters during MNTB development in addition to continuing to add more segmented data to previous analyses. Additionally, we will qualitatively work with newly acquired P30 data and commence necessary quantitative work in order to assess and affirm the validity of our study.

# 70. Extraction of Carotenoids from Pumpkins

### **Christopher Newman and Jerry Thomas III**

West Virginia State University Chemistry

Advisor: Genia Sklute

Carotenoids are nonpolar, highly-conjugated compounds that serve as antioxidants and essential micronutrients for humans. Extraction of carotenoids from natural products is challenging due to their high sensitivity to heat and light. The goal of this research is to develop a straightforward approach for the extraction of carotenoids from pumpkins. Various preparations, extraction techniques, and solvent systems were examined to find the best extraction methods. Experiments showed preparation by freeze drying followed by ultrasound-assisted extraction to be the most viable technique tested, leading to the highest concentration of carotenoids extracted. Further optimization of this method is currently underway.

### 71. Guided Imagery to Address Diet, Exercise, and Perceived Stress; Preliminary Results From a Randomized Control Trial

### **Richard Nolan and Taylor Grenn**

West Virginia University **Psychology** Advisor: Peter Giacobbi

Physical activity (PA) and dietary behavior are important determinants of obesity. In the United States, 67% of adults are considered either overweight or obese with annual economic costs of 82 billion dollars. The current adult obesity rate in West Virginia is 35.1% (ranking 1st in the nation) with 33.1% of all adult women being obese. Clearly, obesity and resulting health impacts are an important public health challenge in West Virginia. Finding practical and cost-effective ways to help individuals maintain energy balance is an important public health challenge. Imagery of diet and exercise (iMade) is a phone-based waiting-list randomized controlled trail using guided imagery (GI) as a behavior change mechanism. Guided imagery is a quasi-sensory or quasi-perceptual experience that allows individuals to create, or recreate, experiences in one's mind at any time or place. It involves the use of memory and emotion to relive events experienced in the past or to imagine future possibilities such as one's health-related goals. The purpose of the iMade project is to test the impact of a five-week GI intervention on exercise behavior, food cravings, and psychological stress with overweight and obese adult women. After pretesting, participants were randomized to the active intervention or a waiting list control. Those in the intervention co-created guided imagery scripts with health educators and established health-related goals. The intervention consisted of daily GI practice, at home, for 35 consecutive days and 5 weekly telephone conversations with assigned health educators. Data from 23 adult women (Mage=46 years) was used in the present report. Participants completed a validated battery of self-report measures that included the leisure-time exercise questionnaire (Godin & Shepherd, 1985), frequency of food cravings (Nijs, Franken, & Muris, 2007), and perceived stress (Cohen, Kamarck, & Mermelstein, 1983). Results from a series of paired samples t-tests showed significant increases in exercise behavior t(23) = -3.18, p<.01. While trends were in the expected direction with reduced food cravings, this result was not statistically significant nor were the changes in perceived stress. Interestingly, post-intervention qualitative interviews revealed the participants were enthusiastic about the use of GI and all but one participant indicated continued usage of GI in their daily lives. GI appears to be an acceptable and possibly effective way to increase exercise behavior. While preliminary findings for food cravings and stress were not statistically significant, additional data collection should provide enough statistical power for significance.

### 72. Extraction of Fe(II) and Zn(II) Ions from Aqueous Solution

#### **Jordan O'Dell**

West Virginia State University Chemistry Advisor: Ernest Sekabunga

Fresh water is one of the most precious resources on earth. Fresh water constitutes only 3% of earth's water and 0.3% of this fresh water constitutes fresh surface water, i.e., rivers, swamps and lakes. It is this fresh surface water that supplies water for most human activity. Thus it is important to have remedies against fresh water pollution. This work focused on the extraction of Fe(II) and Zn(II) ions from aqueous solution utilizing ligands mounted on an insoluble solid support. Four extractors, identified as Ext. 1, Ext. 3, Ext.5, and 3-aminopropyl-functionalized silica gel (APFSG) were utilized. Batch extractions were performed followed by filtration. The Fe(II) and Zn(II) ion concentrations in the filtrates were determined by redox and EDTA titrations respectively. Extractions of over 90% of the metal ions were observed with APFSG.

### 73. Cataglyphis Health and Status Management System

#### Nicholas Ohi

West Virginia University Engineering Advisor: Yu Gu

This research investigated design principles for Health and Status Management (HSM) of autonomous robotic systems. In these kinds of systems, reliability is paramount and a robust software architecture should include components that will monitor the health and status of other parts of the software and computer system, detect problems, and take corrective actions when needed. The design for HSM subsystems are dependent on the design of the system in which they operate; that is, the design for the system to be managed must be somewhat mature before the HSM design can be completed. Thus, for this project, I designed and developed a HSM system for the autonomous robot called Cataglyphis, which is to be used in the NASA Sample Return Robot Centennial Challenge in the summer of 2015 by West Virginia University (WVU). This robot was initially constructed for the challenge this past year (2014), and the WVU team was the only team to successfully complete any stage of the challenge in 2014, winning \$6000 for WVU, WVU will compete in the challenge again in 2015, and the team is looking to improve system reliability to increase our chances of winning the Centennial Challenge grand prize for WVU. The proposed HSM subsystem is intended to increase the reliability of this already complex and fully autonomous robotic system. However, the HSM subsystem must be carefully designed since it adds a layer of control and thus increases complexity, and if not designed properly, can add reliability risk. This project required thorough study of C++ programming, objectoriented software architecture and design, reliability, robustness, and error and fault handling methodologies for real-time control and robotic systems. An initial HSM design was developed based on the 2014 Cataglyphis system design; however, the system design is expected to change, and thus the HSM design had to be flexible and extensible to adjust to changes in the system design. HSM concepts were prototyped and tested, and trade analysis of design alternatives resulted in the final design.

### 74. Relational Attachments and the Psychological Etiology of Obesity and Bulimia Nervosa

#### **Alexis Pandelios**

Marshall University
Psychology

Advisor: Marc Lindberg

West Virginia is currently one of the two heaviest states in the United States, with an adult obesity rate of 35.1% (Levi, Segal, St. Laurent, & Rayburn, 2014). However, current treatment and prevention strategies have, overall, produced limited results (Bahrami, Kelishadi, Jafari, Kaveh, & Isanejad, 2013). The purpose of the present investigation was to examine the possible etiological roots of obesity versus eating disorders in terms of psychological conditions and co-morbidities. Specifically, although many have theorized that obesity is a type of eating disorder and/or addiction with similar presenting conditions, few comparisons have been empirically tested. Feeding maladies such as anorexia nervosa and bulimia nervosa are analogous, in this respect, presenting correlations with these insecure attachment models and clinical issues. To test these hypotheses, 491 college participants completed measures of eating disorders including the 'Are You Dying to be Thin?' Questionnaire (Reiff & Lampson-Reiff, 1992), the Binge Eating Scale (Gormally et al., 1982), the Objectified Body Consciousness Scale (McKinley & Hyde, 1996), the Self-Objectification Questionnaire (Noll & Fredrickson, 1998), the Sociocultural Attitudes Towards Appearance Questionnaire (Heinberg, Thompson, & Stormer, 1995), and the Three-Factor Eating Questionnaire (Stunkard & Messick, 1985). BMI was calculated by measuring the heights and weights of the participants. The attachment and clinical issues were assessed by the Attachment and Clinical Issues Questionnaire (Lindberg & Thomas, 2011). The hypotheses were not supported by the data. Although all measures of eating disorders correlated significantly with the insecure attachment and clinical issues scales, measures of obesity did not. Thus, these data suggest that obesity is not statistically linked to psychological disturbances like eating disorders. This will have important implications for diagnosis, treatment, and prevention programs.

#### 75. Big Data Scale Image Search

#### **Derrick Paris**

Marshall University Computer Sciences

Advisor: Venkat Gudivada

According to some estimates, 90% of the world's data was produced in the last two years. Furthermore, video and images comprise a significant portion of this data. Surveillance video, wireless sensor networks, giga-pixel cameras, smart phones, tablets and other handheld devices are generating image data at unprecedented levels. For example, over 64 million images have been uploaded to Flickr (a photo sharing Web site) in September, 2013 alone. In 2012, more than 300 million images were uploaded every day to Facebook and it accumulated 7 Petabytes of photo content every month. Other very large photo sharing

public Web sites include Picasa and Geograph. Retrieving images based on their content is referred to as Content-based Image Retrieval (CBIR). Though this has been studied actively for over two decades, several problems remain unsolved. With the emergence of Big Data and NoSQL systems, there has been a renaissance in CBIR research. Existing algorithms and system architectures for CBIR are impractical for Big Data image collections. Commercial applications such as Flickr and Picasso use browsing and simple mechanisms for retrieval based on image tags. The ability to locate relevant images from very large collections in real-time has numerous applications in engineering, science, and medicine. The overarching goal of this project is to design rank-based nonparametric statistical algorithms for CBIR which can scale to Big Data image collections. I will also investigate various computational enhancements to these algorithms and implement and evaluate them using high-performance programming paradigms including OpenMP, OpenCL, MPI, MapReduce, CUDA, and OpenACC. Rank-based nonparametric hypothesis tests are used to detect general dependence between two variables in the presence of heteroscedastic treatment effects. Such tests have been used to design algorithms to measure image similarity. However, these algorithms tend to be computationally expensive and are not suitable for interactive image retrieval environments. PSSIM is a p-value-based algorithm based on test of independence between corresponding pixel blocks in images. The images are designated as Q (query image) and D (database image) and each is of size mxn. On Marshall University's supercomputer (BigGreen), the PSSIM algorithm takes more than an hour to compute similarity between two images in serial mode. Our goal is to enhance this algorithm both computationally (by parallelizing computations) and also reducing the number of computations through statistical sampling.

# 76. DEVELOPING METHODS TO STUDY THE FOOD WEB IN THERMOPHILIC ANAEROBIC DIGESTION: CLONING OF ACETATE UTILIZATION GENES AND ANAEROBIC CULTIVATION

#### **Emily Peal**

West Virginia State University Biology

Advisor: David Huber

Engineered anoxic environments, such as anaerobic digestion, rely on complex consortia of bacteria to break down organic wastes produced by agricultural and industrial processes and cities. The efficiency of organic matter breakdown and its conversion to biogas (methane and CO2) depend on a web of metabolic interactions among these microbes. The first step in the food web consists of the hydrolysis of macromolecules (proteins, carbohydrates, lipids) followed by fermentation. In the second step, metabolites from the initial fermentation are further oxidized. In the final step, CO2, hydrogen, and acetate are used to produce methane. The diversity of bacteria occupying the first two steps is not well characterized. This study used two methods to access the diversity of these bacteria: anaerobic cultivation and gene cloning. Anaerobic roll tube cultivation was developed and tested for culturing hydrolytic bacteria. The acetate utilizers, which occupy the second step, are difficult to culture. Therefore, these were identified using PCR-based cloning of a key gene in the homoacetogenesis pathway, formyl tetrahydrofolate synthetase (FTHFS).

# 77. The effect of temperature-induced coral bleaching on the MMP genes in the sea anemone Aiptasia pallida

#### **Emily Ramezan**

Glenville State College Biology Advisor: Sara Sawyer

Reef-forming corals form a mutualistic symbiosis with dinoflagellate algae and it is this symbiosis that provides the corals with the nutrients needed to form massive reefs. Corals are subjected to an increasing array of environmental stresses and under this corals will lose their symbiotic algae, or bleach. We are investigating how temperature affects genes involved in the control and production of the extracellular matrix and in the general stress response of animals. Specifically, we are using rt-qPCR to determine how temperature affects gene expression of a MMP as well as two other ECM genes (collagen and laminin), three stress-sensitive genes (HSP 70, HSP90, and ubiquitin) and three control genes (ribosomal protein L-11 (RPL11), NADH-dehydrogenase 5 (NDH5), and glyceraldehyde-3phosphate dehydrogenase 1(GPD1)). In this study we will use the tropical sea anemone, A. pallida. To date, we have confirmed that eight of the nine primers for each gene have amplified the correct gene product. The eight primers will be used to measure how an increase in water temperature from 25 C to 30C for various time periods (1 hr to 24 hr) affects the expression of those genes. In the next step we will temperature shock anemones for times ranging from 1 hr to 24 hr, isolate RNA, and determine how temperature affects gene expression. Results from this study will help elucidate the underlying cellular mechanisms of temperature-induced Cnidarian bleaching and yield insight into which cellular pathways are affected by increased water temperature.

### 78. The Challenges of Adopting and Implementing Marijuana Legalization

#### Sam Ransbottom

University of Charleston Political Science Advisor: Damien Arthur

This article will attempt to validate the legalization of marijuana in the United States. For decades, groups have advocated for legalizing marijuana for a myriad of reasons. Economic, medicinal and recreational benefits all combine to make a compelling case for marijuana advocates, whose voice only becomes louder as time passes. Marijuana legalization has the potential to affect everything from the crime rate to drug stores. Using peer-reviewed academic journals and data analysis, this article will suggest methods to apply and regulate marijuana legalization. In 2014, the question is not if marijuana will become widely legalized, but how.

### 79. The Case for a Higher Minimum Wage

### **Emily Rector**

University of Charleston Political Science Advisor: Kara Fisher

A federal minimum wage was first established in the United States during the Great Depression in order to keep America's workers out of poverty and to stimulate the economy. Over time, the federal minimum wage has increased in response to inflation, with its last increase occurring in 2009. Last January, however, over 600 economists signed a letter in support of a \$10.10 minimum wage, and a few weeks later, President Obama, in his 2014 State of the Union Address, also called on Congress to raise the federal minimum wage from \$7.25 to \$10.10 an hour. Increasing the federal minimum wage to \$10.10 could benefit millions of workers and families, close the growing income gap, and increase consumer spending. Moreover, because of the recent Great Recession and the high percentage of American workers employed in low-wage occupations, a wage increase seems reasonable. Nonetheless, raising the minimum wage could also have negative effects on the economy. The purpose of this project is to predict what implications a federal minimum wage increase would have on poverty and on the unemployment rate, which will ultimately determine whether or not such legislation should be enacted. In order to predict the effects of a federal minimum wage increase, I propose a comparative case study focusing on the results of state minimum wage hikes in addition to the impact of previous federal minimum wage increases. My project will also examine, through simulations, how raising the federal minimum wage to \$10.10 would affect different groups of people, including the working poor, minorities, single mothers, and teenagers. My research ultimately suggests that an increase in the minimum wage has little to no negative effect on the unemployment rate and that raising the minimum wage to \$10.10 an hour would benefit millions of workers'even those already earning above the minimum wage. I hope to show through empirical research that although an increase in the federal minimum wage is not a cure-all, raising the minimum wage to \$10.10 would help to alleviate poverty, stimulate the economy, and close the income gap.

#### 80. The Overshadowed Effect of Female Abusers

# Michaela Reynolds

Marshall University Psychology Advisor: Marc Lindberg

Partner abuse is a severe problem in West Virginia with one third of the murders in the state stemming from this kind of violence (Rosser 2012). The focus of this research was on the perpetrator of abuse and to compare male versus female abusers. The hypotheses were as follows: a) when the female abuser is emotionally abused, they will be more likely to physically abuse their partner as well, and b) male sexual abuse is more associated with drug abuse whereas alcohol abuse is more clearly associated with partner emotional abuse.

Methods College students (N=491) participated in this Marshall Institutional Board of Review approved study. They completed several different instruments that tap several different constructs. The first questionnaire was the Attachment and Clinical Issues Questionnaire (ACIQ) (Lindberg & Thomas, 2011). The scales that were used to analysis the data included the Revised Conflict Tactics Scale (Straus, Boney-McCoy, & Sugarman, 1996, p. 283), the Adverse Childhood Experiences scale (ACE) (Anda, Felitti, Walker, Whitefield, & Perry, 2006), and the cage and dcage (Dhalla & Kopec, 2007). Results It was found that males were more emotionally abusive to their partner (N= 167) r=0.35, p'.0001) when they were emotionally abused themselves. Further, females were more likely to physically abuse their partner if they were emotionally abused (N-293) r= 0.60, p'.0001). When drugs were used the male subjects were found to be more likely to sexually abuse their partners (N= 155) r=0.31, p'.0001). When alcohol was used males were found to be more likely to emotionally abuse their partners (N=162) r=0.36, p'.0001). Conclusions and implications Unlike that of previous studies, this investigation in focused on the differences between male abusers and female abusers in ways that have not previously been accomplished. The implications of this investigation can spawn further research into the area of females being the abusers in relationship dynamics. Females are typically seen as the weaker of the two and this leads individuals to believe that females cannot be physically and sexually abusive to their male counterparts, but the findings in this study showed that females can also be abusive.

# 81. Assessment of carbon storage among the different forest succession stages in Glenville, West Virginia

#### **Jonathan Rhodes**

Glenville State College Environmental Studies Advisor: Rico Gazal

Carbon sequestration is the act of removing carbon from the atmosphere and holding it in a liquid or solid state. By measuring the amount of biomass, the amount of carbon can be calculated. The total amount of the carbon varies between the different types of canopy cover or forest successional stages. The objective of this study is to quantify carbon storage in different forest succession stages in Glenville, West Virginia. This forest is approximately 224 acres and comprised of oak-hickory type forest with 3 major forest succession stages: old growth, intermediate and early succession. Maps were made using ArcGIS to determine exact locations of plots (900 m2). The aboveground and belowground (roots) biomass and its equivalent carbon storage amounts were determined and compared among different forest succession stages. The above ground biomass and carbon was divided into foliage, stem, and branch with foliage storing the least amount compared to the other tree components. This study reveals that the intermediate stage of forest succession stored the least amount of carbon (6002.6 Ò 3302.6 g m-2), while the old growth stage of succession had the most amount of carbon (20240.7 Ò 3302.6 g m-2). The low amount of carbon in the intermediate forest could be due to the forest undergoing severe competition which can result in self thinning or mortality. The same trend stays relevant when each stage is divided into different components of biomass such as foliage, stem, branch, and roots. The

old growth stage of succession stored the most carbon because it has the most biomass. The intermediate stage with the least amount of biomass, indicating less carbon being stored during this stage. The early stage of succession stored more carbon than the intermediate stage, but less carbon than the old growth stage. This is because there is less competition and high growth in the early succession stage. The amount of biomass and carbon also differ among the species groups with maple/oak type having the highest amount of total biomass (8527.63  $\grave{0}$  1622.4 g m- $\H{0}$ ). West Virginia forests being dominated by the oak/hickory type forest contributes significantly to the carbon storage in the United States.

# 82. Determination of HPLC analysis for Capsaicin and Dihydrocapsaicin in fruits of Capsicum

# Elijah Roberts

West Virginia State University Biology Advisor: Umesh Reddy

We developed a reproducible reversed phase-HPLC separation method has been developed using photodiode array (PDA) detector for direct and simultaneous determination of capsaicin and dihydrocapsaicin in pepper fruit extracts. The linearity range of calibration curve was 12.5-500 Êg/mL with multiple determination coefficients higher than 0.999. The repeatability and reproducibility of both retention time and peak area for these compounds were in good precision with their relative standard deviations (RSDs) lower than 2% and 8%, respectively. Pepper samples analyzed included Prairie fire, Red rocket, Joes long cayenne, Pretty in purple, Sangria, Cajun Tobasco, Tepin Guatemala, Bird's Eye Baby, Tepin and Red Baby. Extraction of capsaicinoids was done using acetonitrile as solvent proved to be the best capsaicinoid extractor in the shortest time interval. Finally, the optimized conditions were applied to quantify both capsaicin and dihydrocapsaicin in ten varieties of pepper samples. Total contents of capsaicinoids were found in the range of 0 - 908.058 ppm. These enhanced techniques provide cost-effective method for quantitative and qualitative analysis of capsaicinoids among the fruit samples.

### 83. The Era of Big Data: Challenges and Opportunities

#### Jesus Ruvalcaba and Osman Guzide

Shepherd University Computer Sciences Advisor: Weidong Liao

The vast amount of data driven from the ever-increasing use of Internet/Web has brought challenges for industry and academia. It demands a combination of fast computers and efficient algorithms to accomplish this task. This poster describes the need and challenges for the popular 'Big Data' problems. It first describes some background and driving forces of big data: data mining, business intelligence, and social networks. Then the poster presents some approaches to solving big data problems, especially in a setting of parallel

and distributed processing: Hadoop and MapReduce. At last we present several examples from business world and academic area. This research is sponsored from an EPSCoR grant awarded to Dr. Colleen Nolan, dean of the School of Natural Sciences and Mathematics at Shepherd University.

# 84. Determination of Crayfish Occupancy Rates across the North, Middle, and South Forks of the Kentucky River

#### **Nicole Sadecky**

West Liberty State College Environmental Studies Advisor: Zachary Loughman

In the Coal Fields of Eastern Kentucky, surface mining is the primary means of coal extraction. Several environmental byproducts of this process have proven to be environmentally deleterious, specifically to aquatic ecosystems. The purpose of this project was to identify conservation concerns and determine habitat preference for the native crayfish fauna of the Headwaters of the Kentucky River Watershed, specifically the South, Middle, and North Forks, where surface mining is occurring. During the summer of 2014, crayfish sampling, physiochemical data acquisition, and physical habitat scores were collected at 60 stream reaches throughout each of the aforementioned basins. Data collected was used in comparison to the presence/ absence of each crayfish species to determine site occupancy. Sampling determined that six crayfish species occur throughout the region, with several of these species being highly specialized or endemic to this watershed. Sulfate levels proved predictive for all crayfish species, levels, with elevated sulfate levels indicative of crayfish absence. Sediment scores also proved predictive, with high sedimentation scores correlative to low crayfish density. Both elevated sulfate levels and elevated sedimentation rates are associated with surface mining impacts. This study indicates that mining and its associated degradation is the most important threat to the regions rich crayfish diversity. Understanding stream and habitat quality will allow for proper conservation of the epigean crayfishes of the Headwaters of the Kentucky River Watershed in the future. With these methods, we hope to raise community awareness on the health and quality of their streams as well as determine conservation efforts needed in protecting epigean crayfishes that can be used in other impacted streams that can aid in the revitalization of stream quality.

#### 85. Ecology of The Rock Crayfish in Northern West Virginia: A Baseline Study

#### Luke Sadecky

West Liberty State College Biology Advisor: Zachary Loughman

The primary goal of this study is to better understand the ecology of the Rock Crayfish, one of the most common Central Appalachian crayfishes, by achieving the first complete ecological and life history study of this species. Understanding Rock Crayfish ecology will

help aid in conservation and protection of closely related imperiled taxa by discovering unknown biological attributes of secondary burrowing crayfish. By collecting various data at a single site and recording one population's responses to changes in the environment, we can determine multiple behavioral strategies that correlate with those environmental changes. In addition, we can determine important life history variables, such as growth rates, fecundity, and required age and size to reach sexual maturity. To date this study has consisted of capturing, measuring, sexing, each captured crayfish, and noting their preferred habitat within a reach (a 20 meter stretch of stream), then repeating this process in various locations along the stream. During the summer months, 384 crayfish were captured and measured. We now know that the dominant carapace length during the summer months is 11 mm. There were 149 crayfish with this carapace length, 87 of which were female. During June, the habitat preference was equally split between the run and riffle. During July, 69% of the crayfish were found in the runs. All of this data was previously unknown for this species, and is providing incite into the biology of this species.

# 86. A Search for FRBs with the Green Bank Telescope

#### **Amy Sardone**

West Virginia University Astronomy Advisor: Maura McLaughlin

Fast radio bursts, or FRBs, are bright, short-duration bursts of light in the radio spectrum. The discovery of the first fast radio burst was made using the Parkes telescope in Australia by Duncan Lorimer in 2007. There have since been 5 other FRBs discovered using both the Parkes telescope and the Arecibo Observatory. The source of these bursts is unknown, but they are believed to be of extragalactic origin due to the inferred presence of a large number of ionized electrons along their lines of sight. Searches for additional FRBs are being carried out using large-scale pulsar surveys which use telescopes like the Parkes, Arecibo, or Green Bank telescopes. Under the direction of Professor Maura McLaughlin, I have been searching through data taken with the Green Bank Telescope in Green Bank, WV for additional FRBs. This search has resulted in finding several FRB candidates, which need additional confirmation. I have provided an example of one of our potential FRBs. The bottom of this image shows a plot of dispersion measure, DM, versus time. There is a clear, bright burst around a DM of 900 pc cm-3, which appears circular in the plot. This is inconsistent with terrestrial noise, which we would expect to see at a DM of 0 pc cm-3.

# 87. Effects of Slope and Temperature on Nitrogen Mineralization and Nitrification at Beech Fork State Park, WV

Jacob Sarmiento and Julia Galloway

Marshall University Biology

Advisor: Frank Gilliam

Previous studies in forests of the northern hemisphere have shown that south-facing slopes are typically subjected to higher solar radiation than north-facing slopes, resulting in higher temperatures, lower moisture content, and higher rates of weathering. We examined the effects of temperature on nitrogen (N) mineralization and nitrification on contrasting slope aspects (northeast'NE versus southwest'SW) of a hardwood stand at Beech Fork State Park, WV. The purpose of the study was to determine (1) the effects of temperature on soil N, (2) variation of temperature effects with slope aspect. Based on previous work at a higher elevation/higher latitude site, we hypothesized net N mineralization would increase throughout the temperature range, but that net nitrification would exhibit a temperature maximum at intermediate temperature. Soil from each slope aspect was incubated for one week at 4, 15, 25, and 35 C. Net N mineralization increased in a curvilinear fashion at both slope aspects, supporting our hypothesis. However, net nitrification also showed a curvilinear increase with temperature for NE soils (no detectable nitrification for SW soils), rejecting our hypothesis. Results suggest that Nprocessing microbes in these soils are adapted to higher temperature regimes, and more highly weathered SW soils inhibit nitrifying bacteria.

#### 88. Conventional and Magnetically-Enhanced Microgravity Soldering

#### Justine Schultz and Gina Eberhart

West Virginia University Engineering Advisor: John Kuhlman

The research proposal was submitted to NASA's Reduced Gravity Education Flight Program (RGEFP) by the current Microgravity Research Team at West Virginia University, in the hopes that it will become possible for the NASA ISC Office of Education to utilize the ISC Reduced Gravity Office (RGO) capabilities to offer student teams the opportunity to participate in the Reduced Gravity Education Flight Program. An investigation is outlined to examine soldering in microgravity conditions. Soldering in this environment is deemed to create inferior joints when compared to those achieved in Earth-gravity (1G). Surface tension will prevent vapors from escaping the liquefied solder in the absence of gravity. The objectives of the proposed experiment are: 1.) to confirm the diminished performance of joints completed in microgravity, and 2.) to evaluate the suitability of magneticallyenhanced solder in making high quality solder joints in microgravity. A body force will be applied during heating of the magnetically-enhanced solder using a constant magnetic field. The team hypothesizes that this action will drive the vapors out of the solder making the solder joints uniform and non-porous. The proposed experimental apparatus will consist of a solder heating system, a sample carriage, data acquisition, a ventilation system, and an experiment frame. During microgravity flight, the heating system, through the assistance of controlled mechanical robotics will make joints that were previously prepared using known volumes of solder, flux, and magnetic particles and put in the sample carriage. This experiment will be performed on both magnetic and non-magnetic solder. A series of control solder joints will also be created in Earth-gravity for comparison. After the flights, the joints will be analyzed primarily through Scanning Electron Microscope (SEM), X-ray Diffraction (XRD), and mechanical testing. The joints will then be compared to determine if

the magnetic solder improved the physical properties of the solder joints. An initial structural and safety analysis of the experimental apparatus has been conducted, and it was determined that little hazard to either passengers or the aircraft will exist during flight operations.

# 89. Polymorphism: Changing Active Pharmaceuticals

#### **Noah Searls**

Marshall University Chemistry Advisor: Rosalynn Qui§ones

Polymorphism is the ability of different molecules to change structures. Drugs' molecular structure variations have been a recent excitement in pharmaceutical research because the change in their physical shape results in differences in function and chemical properties. The properties that may vary include solubility, thermodynamic activity, and energy that may be used by the molecule. Pharmaceutical compounds that undergo polymorphism to produce stable forms at relatively common conditions (room temperature and pressure) have led to many recalls to prevent public consumption of ineffective and/or dangerous medicines. In this study, the method used to screen and reproduce polymorphs, or the different drug forms, was surface modification. The surface in the technique was constructed by using an organic acid self-assembling monolayer (SAM) bonded onto a nickel metal. Three active pharmaceuticals were analyzed, including cimetidine (C10H16N6S), tolfenamic acid (C14H12ClNO2), and flufenamic acid (C14H10F3NO2). Cimetidine, also known as Tagamet, is used for treatment of ulcers and the backward flow of stomach acid commonly known as 'heartburn'. Tolfenamic and flufenamic acid are nonsteroidal anti-inflammatory drugs. Tolfenamic acid (Clotam) is used to treat migraine headaches, while flufenamic acid (Achless) is used for joint pain relief. By applying the compounds on the constructed reformed surface, intermolecular bonds, including hydrogen bonding, develop and generate forces, which pulled the drug's structure in certain areas to alter its shape, and modifying its chemical properties as well. These alterations can ruin the pharmaceutical's initial purpose. For instance, with cimetidine being used for heartburn relief, the variation in structure could change its solubility. Therefore, instead of being absorbed by the stomach, the stomach acid's low pH might dissolve the molecules to be later absorbed in the intestines, which destructs the original design. The study was successful by revealing and reproducing two forms of cimetidine and tolfenamic acid, as well as three forms of flufenamic acid. These forms were proven by a series of instrumental testing through infrared spectroscopy (FT-IR), powder X-ray diffraction (PXRD), and Raman spectroscopy. In result, the research demonstrated that if pharmaceutical compounds, capable of strong intermolecular bonds, are applied to a reformed surface during manufacturing or transporting, then the drugs lose their purpose and can be dangerous to public consumption.

# 90. Women Expatriates from Appalachia: The Effects of Appalachian Culture on a Woman Becoming an Expatriate

#### **Kristen Shafer**

Concord University Business

Advisor: Charlotte Davis

This study will examine the obstacles that Appalachian women face when considering moving into expatriate positions, and how they adjust to separation from their families once the position is taken. It will look into the way that Appalachian culture influences women and how those influences reflect their feelings about working outside of the United States. Strong family ties are a known obstacle for women in general, especially when moving into expatriate positions and adjusting to the new positions. Since the importance of taking care of a family and working hard to support that family are part of the role of an Appalachian woman, those strong family values may hold those women back even more than women in other parts of America when considering an expatriate position.

# 91. Radon as a Screening Tool for Detecting Fracking Flowback Constituents in Freshwater Aquifers: A Pilot Project to Develop and Apply a Scientifically Valid and Economical Sampling Approach.

#### **Brian Simmons and William Niemann**

Marshall University Geology/Earth Science Advisor: William Niemann

Hydraulic fracturing, commonly referred to as 'fracking', has become a major industry in the Appalachian Basin in recent years; since 2005, over 11,000 permits have been issued for horizontal gas wells in West Virginia and Pennsylvania. There are some concerns that fracking fluids or flowback wastes in the Appalachian Basin can enter shallow, fresh (potable) water aquifers due to: 1) improper handling of flowback water at the surface; 2) failure of fracking well casings during fracking, withdrawal of flowback waters, or gas production. The two main objective of this study are to determine if radon is present at above background levels in fresh water aquifers at the wells sampled, and to assess the validity of using E-Perms as an accurate and economic means of quantifying radon concentrations. The rapid expansion of fracking has outpaced the development and implementation of groundwater monitoring strategies, so it has become vital to try to identify successful strategies that can help to mitigate this misbalance. The E-Perm method, if determined to be a viable technique for the quantitative assessment of radon, could provide a cheaper and faster alternative for individuals who are concerned about possible water contamination. This particular study looks at private well locations in Harrison, Doddridge, Preston and Taylor counties. The wells vary in their proximity to locations where hydraulic fracturing has occurred/ is occurring. Two replicates of each sample were collected: one set is being analyzed by the cheaper and faster E-Perm method, the other was sent to a laboratory in Fort Collins, Colorado, to be analyzed by scintillation (US EPA

method 913.0). The scintillation data will be used to determine the accuracy of the E-Perms. Current analyses suggest that the E-Perm's are not sensitive enough to detect the radon at the levels detected from the scintillation analyses in the samples.

#### 92. Synthesis of Capsaicin Analogs

#### **Tabatha Slater**

West Virginia State University Chemistry

Advisor: Mike Fultz

Cancer statistics show that the incidence of lung cancer, breast cancer, and prostate cancer is lower in countries (India, Thailand, and Mexico) where the diet has a high concentration of capsaicin. Capsaicin has displayed promise as a potential anticancer agent for the management of multiple human cancers. Aggressive malignancy representing 13% of all lung cancers cases, with an overall 5 year survival rate of less than 5%. Capsaicin is the chemical found in peppers that causes a burning sensation when eaten. It is currently used in ointments for treatment of pain and inflammation; however, there are promising studies that show capsaicin could be an effective anti-cancer nutritional agent. Capsaicin is highly selective for several human cancer cells causing apoptosis and cell cycle arrest in those cells but leaving healthy cells untouched. Due to the toxicity level of capsaicin, there was a need for analogs and metabolites to further research efforts into their potential anti-cancer effects. The synthesis of 4 of the analogs from the Capsiconinoid and Capsinoid family has been completed and has been submitted for further study into its biological activity at Marshall University. The synthetic effort included synthesizing the benzylic and allylic alcohols to be coupled with carboxylic acids to form the required esters of the target compounds.

# Capsiconinoids

Nordihydrocapsiconiate

#### Capsinoids

Nordihydrocapsiate

### 93. A Pendulum Mechanism for AHR Regulated Cell Proliferation

#### **Randy Smith**

Glenville State College Biology

Advisor: Gary Morris

The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor associated with endocrine disruption when it interacts with environmental toxicants. Recent research suggests that it may also be an endogenous gene required for cell proliferation, although the mechanism of action is currently unknown. Elucidation of the mechanism of action may provide new targets for chemotherapy, with other possible applications. We outline a potential pendulum mechanism in which AHR promotes cell proliferation, through cytoplasmic roles, and promotes cell cycle arrest, through roles in the nucleus, upon activation by a ligand. Once bound by an exogenous ligand AHR is moved into the nucleus where it binds to AHR response elements (AHREs) in the promoter regions of certain genes, thus increasing the expression of these genes. We suggest that the inverse is also true; AHR does not move into the nucleus unless bound by an exogenous ligand. We suggest that one gene promoted by AHR is the enhancer of zeste homolog 2 (EZH2) which is a component of the polycomb repressive complex 2 (PRC2). PRC2 is responsible for the tri-methylation of histone 3 at lysine 27 (H3K27Me3) which suppresses cell proliferation. Preliminary data suggests that activation of AHR may be linked to an increase in H3K27Me3, thus supporting this mechanism. We are currently attempting to determine the validity of this mechanism by: confirming AHR binding of EZH2 using luciferase assays, confirming H3K27Me3 increase upon AHR activation using immunobloting technique, and determine whether AHR moves into the nucleus in the absence of an exogenous ligand using immunofluorescence techniques.

### 94. Network Scout, Defending the Inside of Your Network

# Aedan Somerville and Shawn Jordan

Marshall University Computer Sciences Advisor: Bill Gardner

A tsunami warning system detects rogue waves before they cause massive damage or loss of life. These buoys, (called DARTS) are put in place to monitor seismic wave disturbances that could be indicative of tsunami behavior. If the buoys detect an anomaly they send a warning signal to the island or coastline. Network Scout works the same way, but instead of the ocean, your network is being monitored for malicious intrusions or attack. Network Scout is a distributed multi-layer honeypot monitoring service that watches the inside of your network. A honeypot is a decoy setup to gather information on an intruder in your system. Once the intruder tries to scan the honey pot it alerts the user and bans the IP address of the intruder, barring them from entry to sensitive documents. Scout utilizes multiple honeypots to monitor and protect your network. We combined the honeypot Artillery, created by TrustedSec, and installed it on a number of Raspberry Pi units. The

team, Shawn Jordan and Aedan Somerville, are the authors of the python and php code necessary for the Raspberry Pi array (Scout units) to talk to each other over the server. One Scout unit is designated the server head that gathers the warnings from the Scout units and displays them on a webpage, also created by the team. We created a github account in order to provide a tutorial to build Network Scout and install the scripts for the server, client, and webpage software. The entire project took about 3 months to complete starting from the May to August 2014. Grant money was utilized to buy the necessary hardware and software needed to build Network Scout along with other necessary expenditures. We are grateful to the DOW-MU STEM program, and the State of West Virginia for funding our team giving us the opportunity to learn about network defense and servers. We would also like to acknowledge the assistance, support, and leadership of Bill Gardner of Marshall University's IST Department for his guidance and wisdom. We would be honored to share our knowledge of Network Scout and the network security benefits it has to offer at the Capitol in Charleston if the invitation is extended.

# 95. Comparative Analysis of the Predictive Capability of STEO and NYMEX Natural Gas Futures-Based Forecasts

### Stephen Sullivan

West Virginia University Business Advisor: Xiaoli Etienne

In the capital-intensive natural gas exploration and production industry there is an acute need for accurate and up-to-date commodity price predictive capability. Strategic business decisions regarding expansion or contraction of operations and commitment to geographic areas rely primarily on their expected profitability, an indicator that heavily depends on projected prices in the future. Oil and gas exploration companies operating in West Virginia make vital contributions to our state's gross domestic product and to the economic health of our state's residents through direct and residual employment. The ability to accurately forecast future natural gas prices enables operators to make both long- and short-term decisions that have implications for tax revenue, employment, industry partnerships, and organic entrepreneurship. Oil and gas exploration and production firms obtain price forecasts primarily from two sources: the Short-Term Energy Outlook (STEO) forecasts released by the US Energy Information Administration (EIA) and New York Mercantile Exchange (NYMEX) natural gas futures contracts. Previously published research has examined the predictive capability of STEO and futures-based forecasts, finding that the latter slightly outperforms the former. However, the time frame of the price history used in these studies (1998-2004) predates the widespread exploitation of shale plays through horizontal drilling and hydraulic fracturing. The capability to exploit these unconventional shale plays'like the Marcellus and Utica Shale formations in West Virginia'has not only led to increased domestic production, but also heightened volatility in natural gas prices. The new paradigm of an abundant domestic supply and increasing usage of natural gas make a renewed analysis of natural gas price forecasts both timely and important. This research will evaluate how well STEO and NYMEX futures-based forecasts from August 2005 to October 2014 are able to predict the natural gas spot prices in Henry Hub (a distribution

hub on the natural gas pipeline system in Erath, Louisiana). Under the guidance of my research advisor, I will evaluate the forecast performance of STEO reports, NYMEX futures contracts, and an autoregressive integrated moving average (ARIMA) model using several statistical measures (the root mean squared forecast error and the mean squared percentage forecast error). If resources allow, this research will also explore the application of Bayesian modeling principles'which assign probabilities to not only historical data but also judgments about evolving and dynamic present conditions'to ascertain if a more accurate forecast model can be constructed.

#### 96. Operating Room Door Traffic Monitoring and Modification System

### **Scott Taj**

Marshall University Computer Sciences Advisor: James Day

Among the risk factors for surgical site infection is the quality of air in the operating room. Maintaining clean air during a surgical procedure contributes to reduced risk of surgical site infection. Operating rooms are equipped with air-flow systems that maintain the quality of the air, but each time the door to the operating room is opened the air-flow system is disrupted. This disruption increases the risk of surgical site infection. Tracking and reducing the frequency of door openings during an operative case may serve to decrease risk of surgical site infection. Data collection will be achieved through the use of a custom built electronic device. The device consists of three main components. The first is the microcontroller. The microcontroller is essentially a lightweight computer. This computer uses custom software to interpret data from the second component, the magnetic reed switch. A WiFi shield is used to connected to a wireless network and push the data out. The data is transmitted after every door opening and is time stamped by the remote server. The custom software on the server stores the information as comma separated values in a text file so that it can be imported to Excel for analysis. If it is determined that this data collection method is effective the device will be integrated with a tool for tracking the reason for door openings. This tool will provide meaningful data on the door openings so that changes can be made to policies and procedures to reduce foot traffic in and out of the operating room (e.g. maintaining common equipment in the room, scheduling breaks, etc.).

# 97. Laboratory analysis of individual and collective particle charging, electrostatics, and hydrodynamics relevant across atomic through extragalactic scales

### Jonathan Tucker and William Rogers

West Virginia University Physics

Advisor: Mark Koepke

A fundamental-level investigation of electrostatic charging behavior was conducted on a gas-solid multiphase fluid system in an attempt to quantify and model the influence of

granular charging on fluidized-particle beds. The investigation focused on the effects of the materials properties and operating conditions on the particle charging. The impact of the charged particles on the hydrodynamics of the system was also studied. Speculations of the work functions that are presumed to govern charge magnitude are presented from the data collected. Based on experimental and simulation circulating-loop analysis of granular materials properties and charge state, we introduce as a hypothesis the concept of separate charging and discharging work functions with grain-charge dependence. Our strategy is to test this work-function hypothesis in laboratory facilities for electrostatics and multi-phase hydrodynamics related to dusty lunar regolith, surface, and exosphere.

#### 98. Language Variation in West Virginia

### Emily Vandevender, Jordan Lovejoy, and Margery Webb

West Virginia University

English

Advisor: Kirk Hazen

The West Virginia Dialect Project, established by Dr. Kirk Hazen in 1998, studies language variation in Appalachia and teaches the public about language in the Mountain State. Three distinct phases have been outlined for achieving these objectives: (1) establishing a sociolinguistic baseline for English in Appalachia, (2) studying phonetic variation in the region, and (3) exploring how West Virginians create social meaning with language variation. Most recently, the WVDP has been conducting sociophonetic research that focuses on the correlation between the sounds speakers produce and the social and demographic factors. Consonants have been a particular area of our research emphasis because, in terms of synchronic variation, they are vastly understudied compared to vowels. This study investigated the level of devoicing in a historically voiced consonant in English, the sibilant Z. In this research, we compared the acoustic measurements of speakers' Z (as in buzz) with the voiceless sibilant S by conducting statistical analyses to determine if any significant differences were observed. Using computer software designed for analyzing speech in phonetics, we examined 67 interviews from the West Virginia Corpus of English in Appalachia. We focused on words with sibilants in specific phonological environments: word-internal (such as 'thou[z]and') and word-final (such as 'bee[z]'). Data for acoustic qualities such as sibilant duration, glottal pulsing, center of gravity, preceding vowel intensity, pitch, and duration were collected. Results indicate that variation between Z and S is characterized by a complex set of acoustic qualities that vary widely between speakers. The traditional description of the difference between Z and S is whether or not the vocal folds are vibrating, but WV speakers use many other qualities than just that one. A major trend in the data indicates that many of the acoustic qualities overlap, including glottal pulsing and preceding segment duration. Some change over time can between the oldest and youngest speakers in the extent of these overlaps. Virginia speakers are more similar to other communities than traditional stereotypes allow, as can be seen with their Z variation, and the reality of their variation is complex. West Virginia dialects are changing over time, but they are certainly not fading away.

### 99. The Measurement of Cultural Dimensions as Justified by Geert Hofstede

#### **Katherine Wade**

Concord University Business

Adivosr: Mohan Pokharel

In today's growing technological society, it can be an exciting and terrifying experience to manage or even work for an international company. You may be unsure as to how you properly communicate with someone in another culture. What should you expect? What is acceptable behavior and what is not? Starting and maintaining interpersonal and intercultural connections is absolutely key in factoring cultural diversity into developing an organizational strategy and managing people. The big question is whether we are only able to learn these things as we go, or follow a guideline for what we need to do.

#### 100. SAM: An Interactive Cyber Defense Education System

# Dylan Watson, Andrey Yanev, and Joshua Montgomery

Marshall University Computer Sciences Advisor: Paulus Wahjudi

Cyber security is becoming a growing issue in today's technology. With more information being stored in the cloud and more connections between our devices comes a raised concern in knowing how to protect your devices from unwanted access. Currently in cyber security courses, students learn the theory of cyber security, but they do not have an opportunity to apply their knowledge. Students being taught in cyber security need to have experience on what it is actually like to defend and secure a system. The development of hands-on series of challenges on a compromised system will allow a user to work through common exploits of a system. The challenges will progressively get more difficult and require more problem solving and critical thinking skills, which will simulate a real-world environment. The challenges will expose the users to topics such as closing unused ports, creating special permissions on important files within the operating system environment, creating firewall rules to only allow defined connections to specific ports, protocols or network interfaces. Through this exposure, we aim to improve the ability of students to secure their system and defend against an actual attack. Self Attacking Machine, or SAM, will be a cyber security education system that will put a student's ability to defend and secure a system to the test. We will be developing a custom operating system with malicious programs that will have the machine 'attack' itself. The malicious programs will run when a user chooses to start a challenge. For each challenge students will be given the amount of time they have to defend and secure the system, how many points the challenge will be worth, and a hint about what system vulnerability we will be using to be malicious. Once the user starts the challenge, the machine will then begin to 'attack' itself by launching a malicious program that we created. The user will then have to determine what is

happening to the machine, figure out what vulnerability the program is using, then stop the use of that vulnerability.

#### 101. Predictors of Crime in West Virginia College Students

#### **Katelyn Weiger**

Marshall University Psychology

Advisor: Marc Lindberg

West Virginia's estimated number of violent crimes in 2012 was 5,943 and the estimated number of property crimes in 2012 was 44,500 (WV Crime Rates, 2013). Studies show that some of the most common predictors of crimes are early conduct problems before age five, teenage or single mothers, large families, or low socioeconomic status (Murray, Irving, Farrington, Colman & Bloxsom, 2010). This study investigated what the primary predictors of children growing into criminals are. More specifically, we examined what type of parenting, socioeconomic status, drinking or drug abuse, and adverse childhood experiences criminals and people who admit to could have crimes have in common. We predicted that the biggest predictors of crime would be socioeconomic status, physical or sexual abuse, adverse childhood events, and peer crime. To test these hypotheses we conducted a study where 624 college students from first year psychology courses completed a series of surveys measuring many different possibilities over a course of two days. Many questionnaires were given to the participants and the ones pertinent to this study were the ACIQ (Lindberg & Thomas, 2011), the ACE (Felitti & Anda, 1997), the CAGE (Dhalla & Kopec, 2007), and the Brief Sensation Seeking Screening-4 (Stephenson, Hoyle, Palmgreen & Slater, 2003). We tested for child crime, college crime, and crimes they could have been arrested for. The hypotheses were supported by significant correlations between scores on the number of crimes committed scales and scales measuring peer crime, adverse childhood events, childhood abuse, and being addicted to the thrills associated with crime. These results will be discussed in terms of interventions that can cut costs and improve public safety by reducing rates of recidivism and relapse to drugs.

# 102. Increasing the Efficiency of LEDs through the Fabrication of Photonic Crystals using Nanosphere Lithography

# Melanie Wieland, Taylor Price and Anand Kadiyala

West Virginia University Engineering

Advisor: Jeremy Dawson

Currently, light emitting diodes (LEDs) have issues like low light extraction efficiency and suboptimal current voltage characteristics. These issues can be addressed by changing the materials used when fabricating the LEDs. However, the extraction efficiency still tends to be low due to the fact that light gets trapped within the dielectric layers. With the addition of photonic crystals (PhCs), the efficiency can be increased. There are many techniques to

fabricate PhCs, but they tend to be expensive, time consuming, and only cover a small area of the substrate. Nanosphere lithography (NSL), on the other hand, is an inexpensive technique that has the ability to cover an entire substrate in a PhC. Various NSL techniques are explored to try to achieve an ordered monolayer two dimensional PhC without defects. These are done first on a smooth substrate to optimize the technique and then on a patterned substrate that simulates the patterns used on LED surfaces. The results are then observed by an optical microscope and a scanning electron microscope.

# 103. Implementation of a 'Sliding Window' Technique to Identify Hot Spots for Deer-Vehicle Collisions in West Virginia

#### **Andrey Yanev**

Marshall University Computer Sciences Advisor: Andrew Nichols

Deer vehicle collisions are very common in West Virginia. For six straight years, State Farm Insurance has ranked West Virginia as the #1 state in terms of probability of a driver hitting a deer. Because of this ongoing problem, a research project to identify hotspots for deer-vehicle collisions will be very helpful, as it will provide more information about where the true hotspots are, and it will be easier to analyze them. After a driver has hit a deer, the police often fill out a crash report and mark that a deer was the cause of the crash. The location information for each crash is reported, and the route and milepost to the nearest tenth of a mile are recorded. There were approximately 6,000 deer vehicle crash reports from 2008-2012. The analysis conducted for that study divided the roadway network into fixed 'mile segments for analysis. For example, segment 1 on I-64 was from milepost 0.0 to 0.5, segment 2 was from 0.5 to 1.0, and so on. This is not the preferable method to use for identifying hotspots since the start and end points are fixed. Instead, it would be preferable to analyze all possible half-mile segments, from 0.0 to 0.5, 0.1 to 0.6, and so on. Furthermore, it will be better if not only half-mile segments are analyzed, but also larger segments, such as a mile, two miles, five miles, and even ten miles. This project will benefit both drivers and West Virginia Department of Highways personnel, as knowing the hotspots of deer collision in the state can help drivers prepare and be on the watch for deer at those spots, and state officials can designate the area better to help minimize deer collisions. Using this system will prove to be efficient and easy, and with just a few simple clicks information about the hotspots will be displayed, which will make the work of state officials easier. In the future, the system can interact with other sources to better determine the cause of deer collisions, and that will help state officials understand better what is needed in order to limit deer collisions as much as possible. It is also possible for the West Virginia Department of Highways to include this information into the WV511 system, which provides real-time information for travelers about anything concerning their trips.

# 104. Determination of Capsaicin in Peppers by High Performance Liquid Chromatography

#### **John Yost**

University of Charleston Chemistry David Haas

The 'hotness' of peppers is directly related to the level of capsaicin present in the peppers. A method was developed to extract capsaicin from pepper samples, with subsequent determination of capsaicin by high performance liquid chromatography (HPLC). Seven pepper samples, including hot cherry, habanero, yellow chili, jalapeno, yellow bell, red bell, and green bell peppers were prepared in duplicate, and analyzed using HPLC. Pepper samples were dried, extracted with acetonitrile, filtered, and analyzed by HPLC, using isocratic elution (75% methanol-water) and capsaicin determination in the UV, at 220 nm. Results of capsaicin in the peppers ranged from 16.4 mg/g pepper (habanero pepper) to no capsaicin detected (green pepper). Dihydrocapsaicin was also detected but not quantitated. There was a good correlation of capsaicin results with the Scoville heat scale for chili peppers.

### 105. Impact Response of Mine Roof Bolts Engineered with Known Defects

# **Brandon Moore and Evan Tolley**

Marshall University Engineering Advisor: Jeffery Huffman

In the United States approximately 100 million mine roof bolts are installed in underground applications every year. Roof bolts are utilized due to their performance, cost-effectiveness and safety to create a roof support system that allows mining operations to occur safely. Conventionally the bolting quality has been determined by pull-out testing or torque wrench testing, which are both time consuming and destructive. Currently, there is no method to perform non-destructive testing on roof bolts. If feasible, this proposed technique would provide an ideal non-destructive evaluation technique. this research is to verify techniques and advance the understanding on how nondestructive testing can be performed to evaluate roof bolt integrity for locating compromised roof bolts, therefore decrease mine roof fall and increasing mine safety. The proposed approach enables an accurate and effective quantification of the dynamic system parameters and establishes the analytical model for the design, development and performance monitoring of roof bolts. The approach that will be taken in the laboratory involves nine fabricated concrete specimens, each with a roof bolt-grout bond interface. Eight of the nine specimens were constructed with known bolt-grout defects at a known location. One test specimen is fully bonded throughout the bond zone and will be used as a The dynamic properties of roof bolts in rock are characterized solely control specimen. by dynamic wave measurements. The acceleration wave reflections within the bolt-grout specimens will be recorded using axial impact testing in a laboratory. The varying wave

profiles are used as preliminary signatures to characterize bond defects in the specimens. By using the impact signals of a given bolt system, the proposed method can quickly and efficiently characterize the dynamic properties of the system. This research will provide a non-destructive roof bolt integrity analysis technique that can be utilized by the mining industry to improve mine safety.

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