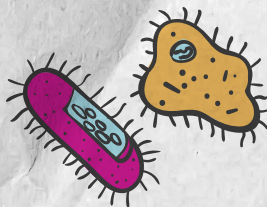
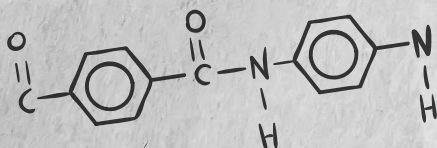
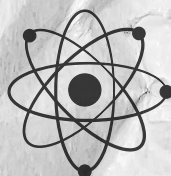


13th Annual Undergraduate **RESEARCH** **DAY AT THE** **CAPITOL** | February 25, **2016**



PARTICIPANTS BY HOUSE DISTRICT

House #	Participant	Number
1	Brittany Bennington	109
	Stephanie Curry	53
	Emily DeTemple	34
	Kristen Mastrantoni	86
	Roger Targosky	42
2	Victoria Daniel	54
	Scott Browning	42
3	Brent Bishop	69
	Casey Dolan	79
	John Lucas	58
	Megan Randolph	111
4	Olivia Shreve	24
	Robyn Wiseman	104
5	Brittany Carver	74
	Courtney McDonald	88
6	Michael Bailey	6
	Timothy Johnson	6
	Tara Weese	103
7	Mariah Cottrill	110
	Krishawna Harless	16
9	Katarina Richards	22
11	Megan Boone	105
	James Gainer	105
	Cassandra Richards	31
12	Lloyd Border	70
	Corey Hall	40
13	Alexandria Fisher	29
14	Noah Searls	23
15	Claire Shanholtzer	62
	Patrick Thomas	99
16	Megan Guetzloff	56
	Scott Taj	22
17	Aaron Holland	19
	Jordan Martinez	14
	Amanda Smith	63
18	Benjamin Coleman	14
	Andrea Hensley	18
	Luke Yingling	33
19	Adam O'Neal	21
20	Matthew Parsley	93
22	Josh Davidson	55
	Casey Owens	61
23	Jon Ball	35
	Samantha Garretson	15
27	Katherine Engo	7

	Nicole Hash	8
	Randall Hash	8
	Daniel Richards	40
	Natalia Sklioutovskaya-Lopez	32
28	Nicole Hegele	82
	John Hunter	41
	Aaron Paynter	41
	Kyle Reinholt	9
29	Brett Floyd	37
30	Dakota Bowyer	71
	Krista Harris	17
	Joey Stout	40
32	Lacey Andrews	4
	James Coffman	36
	Kelsey Frank	38
	William Prather	43
33	Daniel Noel	45
	Emily Ramezan	12
	Daniel Noel	45
34	Alexa Greenlief	72
	Dwight Wilson	45
35	Robert Gresham	38
36	Domenic Cipollone	75
	Lindsay Clark	28
	Jessica Keenan	83
	Seth McCormick	59
	Emma Nellhaus	60
37	Laura Hedrick	57
	Barrett Lynch	43
	Justin Spradling	64
	Lesli Taylor	46
38	Hunter Aliff	50
	Jana El-Khatib	87
39	Morgan Bright	52
	Paige Rutter	108
40	Brandi Bricker	51
42	Emily Vandevender	100
	Brianna Austin	65
	Kelsey McCoy	87
43	Kelsie Krantz	106
45	Emma Malcomb	107
46	Jared Ballard	66
	Maren Wentzel	13
49	Marshall Barbe	1
51	Savanah Alberts	51
	Jared Beard	68
	Sarah Campbell	73
	Haley Glover	101

	Nila Manivannan	101
	Christine Odom	91
	Nicholas Ohi	92
	Charles Peck	73
	Shruthi Sreekumar	27
	Kelly Stake	97
	Allison Thompson	87
	Shanawar Waris	102
52	Jessie Feather	10
	Tyler Groves	10
60	Emilie Piatek	26
64	Tia LeMaster	1

PARTICIPANTS BY SENATE DISTRICT

Senate #	Participant	Number
1	Brittany Bennington	109
	Brent Bishop	69
	Stephanie Curry	53
	Emily DeTemple	34
	Casey Dolan	79
	Kristen Mastrantoni	86
	Megan Randolph	111
2	Brittany Carver	74
	Christine Odom	91
	Emily Ramezan	12
	Shruthi Sreekumar	27
	Roger Targosky	42
	Allison Thompson	87
	Tara Weese	103
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	John Lucas	58
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	Cassandra Richards	31
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	Claire Shanholtzer	62
	Olivia Shreve	24
	Patrick Thomas	99
	Benjamin Coleman	14
5	Megan Guetzloff	56
	Krishawna Harless	16

	Andrea Hensley	18
	Aaron Holland	19
	Jordan Martinez	14
	Scott Taj	22
	Luke Yingling	33
6	Michael Bailey	6
	Katherine Engo	7
	Nicole Hash	8
	Randall Hash	8
	Timothy Johnson	6
	Adam O'Neal	21
	Matthew Parsley	93
	Natalia Sklioutovskaya-Lopez	32
7	Jon Ball	35
	Josh Davidson	55
	Samantha Garretson	15
	Casey Owens	61
8	Brandi Bricker	51
	Morgan Bright	52
	Lindsay Clark	28
	Jana El-Khatib	87
	Seth McCormick	59
9	Dakota Bowyer	71
	Brett Floyd	37
	Krista Harris	17
	Nicole Hegele	82
	Daniel Richards	40
10	Lacey Andrews	4
	Brianna Austin	65
	James Coffman	36
	Kelsey Frank	38
	John Hunter	41
	Kelsey McCoy	87
	Aaron Paynter	41
	William Prather	43
	Kyle Reinholt	9
	Emily Vandevender	100
11	Kelsie Krantz	106
	Emma Malcomb	107
	Paige Rutter	108
12	Jared Ballard	66
	Alexa Greenlief	72
	Daniel Noel	45
	Maren Wentzel	13
	Dwight Wilson	45
13	Savanah Alberts	100
	Jared Beard	68
	Haley Glover	101

	Nila Manivannan	101
	Courtney McDonald	88
	Christine Odom	100
	Kelly Stake	97
	Shanawar Waris	102
14	Sarah Campbell	73
	Jessie Feather	10
	Tyler Groves	10
	Nicholas Ohi	92
	Charles Peck	73
15	Marshall Barbe	1
	Tia LeMaster	11
16	Emilie Piatek	26
17	Domenic Cipollone	75
	Robert Gresham	39
	Laura Hedrick	57
	Jessica Keenan	83
	Barrett Lynch	43
	Emma Nellhaus	60
	Amanda Smith	63
	Justin Spradling	64
	Joey Stout	40
	Lesli Taylor	46
38	Hunter Aliff	50
	Jessica Clegg	76
45	Megan Boone	105
	James Gainer	105

OUT-OF-STATE PARTICIPANTS

State/Country	Participant	Number
Arizona	Mark Magallanes	44
Brazil	Talita Nunes de Faria	90
California	Tyler J Simpson	96
Indiana	Sarah Campbell	73
Malaysia	Lyang Suan Wang	49
Maryland	Bradley Davidson	26
	Tavon Johnson	37
	Samantha King	66
	Kyle Fidler	106

	Evelin Flamenco	80
	Kyle Fidler	2
	Lori Koenick	85
	Matthew Steinheimer	98
New Hampshire	Hanah Conlan	77
New Jersey	Jordan Garry	81
	Christian Gongob	3
North Carolina	Robert Leibel	62
Ohio	Mina Shahbodaghi	95
	Sarah Battista	67
	Patrick Kelly	84
	Eric Sias	25
	Sophia Mills	20
Pennsylvania	Jessica Clegg	76
	Anika Coolbaugh	78
	Emma Veshecco	101
	Jessica Pontis	111
	Robert Ralston	94
Texas	Aaron Mattox	7
Virginia	Alexandra Buckner	72
	Ryan North	89
	Laura Stevens	5

PARTICIPANTS BY FIELD (first authors only) #

Agriculture

Sarah Battista	67
Jessica Clegg	76
Jordan Garry	81
Jessica Keenan	83
Matthew Parsley	93
Tyler J Simpson	96

Astronomy

Megan Guetzloff	56
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Biology

Hunter Aliff	50
Lacey Andrews	4

Marshall Barbe	1
Lloyd Border	70
Brittany Carver	74
Lindsay Clark	28
Stephanie Curry	53
Victoria Daniel	54
Josh Davidson	55
Kyle Fidler	2
Christian Gongob	3
Lori Koenick	85
Kristen Mastrantoni	86
Seth McCormick	59
Ana Maria Pena Castro	30
Emily Ramezan	12
Natalia Sklioutovskaya-Lopez	32
Amanda Smith	63
Shruthi Sreekumar	27
Kelly Stake	97
Laura Stevens	5
Patrick Thomas	99
Shanawar Waris	102
Maren Wentzel	13

Business

Brianna Austin	65
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Chemistry

Megan Boone	105
Brandi Bricker	51
Morgan Bright	52
Benjamin Coleman	14
Emily DeTemple	34
Samantha Garretson	15
Andrea Hensley	18
Aaron Holland	19
Kelsie Krantz	106
Tia LeMaster	11
Emma Nellhaus	60
Noah Searls	23
Eric Sias	25
Justin Spradling	64
Robyn Wiseman	104

Communications

Dakota Bowyer	71
Laura Hedrick	57

Computer Science/Information Technology

Kyle Reinholt	9
Katarina Richards	22

Education

Jared Ballard	66
Patrick Kelly	84

Engineering

Jon Ball	35
Jared Beard	66
Brent Bishop	69
Domenic Cipollone	75
James Coffman	36
Anika Coolbaugh	78
Brett Floyd	37
Robert Gresham	39
Corey Hall	40
Nicole Hegele	82
John Hunter	41
Robert Leibel	42
Barrett Lynch	43
Daniel Noel	45
Ryan North	89
Talita Nunes de Faria	90
Nicholas Ohi	92
Paige Rutter	108
Matthew Steinheimer	98
Suman Thapa	47
Levi Thornton	48
Lyang Suan Wang	49

English

Emily Vandevender	100
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Environmental Studies

Casey Dolan	79
Jessie Feather	10
John Lucas	58
Emma Malcomb	107
Claire Shanholtzer	62

Geography

Sarah Campbell	73
Evelin Flamenco	80

History

Christine Odom	68
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Mathematics

Adam O'Neal	16
Emilie Piatek	26

Philosophy

Tara Weese	103
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Political Science

Sophia Mills	20
Luke Yingling	33

Psychology

Michael Bailey	6
Brittany Bennington	109
Alexandra Buckner	72
Hanah Conlan	77
Mariah Cottrill	110
Katherine Engo	7
Alexandria Fisher	29
Kelsey Frank	38
Krishawna Harless	16
Krista Harris	17
Nicole Hash	8
Mark Magallanes	44
Kelsey McCoy	87
Courtney McDonald	88
Jessica Pontis	111
Robert Ralston	94
Cassandra Richards	31
Mina Shahbodaghi	95
Olivia Shreve	24
Lesli Taylor	46
Emma Veshecco	101

Sociology

Casey Owens	61
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PARTICIPANTS BY INSTITUTION (first authors only) #

Alderson Broadus College

Marshall Barbe	1
Kyle Fidler	2
Christian Gongob	3

Bluefield State College

Lacey Andrews	4
Laura Stevens	5

Concord University

Michael Bailey	6
Katherine Engo	7
Nicole Hash	8
Kyle Reinholt	9

Fairmont State University

Jessie Feather	10
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Glenville State College

Tia LeMaster	11
Emily Ramezan	12
Maren Wentzel	13

Marshall University

Benjamin Coleman	14
Samantha Garretson	15
Krishawna Harless	16
Krista Harris	17
Andrea Hensley	18
Aaron Holland	19
Sophia Mills	20
Adam O'Neal	21
Katarina Richards	22
Noah Searls	23
Olivia Shreve	24
Eric Sias	25

Shepherd University

Emilie Piatek	26
Shruthi Sreekumar	27

University of Charleston

Lindsay Clark	28
Alexandria Fisher	29
Ana Maria Pena Castro	30
Cassandra Richards	31
Natalia Sklioutovskaya-Lopez	32
Luke Yingling	33

West Liberty University

Emily DeTemple	34
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West Virginia Institute of Technology

Jon Ball	35
James Coffman	36
Brett Floyd	37
Kelsey Frank	38
Robert Gresham	39
Corey Hall	40
John Hunter	41
Robert Leibel	42
Barrett Lynch	43
Mark Magallanes	44
Daniel Noel	45
Lesli Taylor	46
Suman Thapa	47
Levi Thornton	48
Lyang Suan Wang	49

West Virginia State University

Hunter Aliff	50
Brandi Bricker	51
Morgan Bright	52
Stephanie Curry	53
Victoria Daniel	54
Josh Davidson	55
Megan Guetzloff	56
Laura Hedrick	57
John Lucas	58
Seth McCormick	59
Emma Nellhaus	60
Casey Owens	61
Claire Shanholtzer	62
Amanda Smith	63
Justin Spradling	64

West Virginia University

Brianna Austin	65
Jared Ballard	66
Sarah Battista	67
Jared Beard	68
Brent Bishop	69
Lloyd Border	70
Dakota Bowyer	71
Alexandra Buckner	72
Sarah Campbell	73

Brittany Carver	74
Domenic Cipollone	75
Jessica Clegg	76
Hanah Conlan	77
Anika Coolbaugh	78
Casey Dolan	79
Evelin Flamenco	80
Jordan Garry	81
Nicole Hegele	82
Jessica Keenan	83
Patrick Kelly	84
Lori Koenick	85
Kristen Mastrantoni	86
Kelsey McCoy	87
Courtney McDonald	88
Ryan North	89
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Christine Odom	91
Nicholas Ohi	92
Matthew Parsley	93
Robert Ralston	94
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Kelly Stake	97
Matthew Steinheimer	98
Patrick Thomas	99
Emily Vandevender	100
Emma Veshecco	101
Shanawar Waris	102
Tara Weese	103
Robyn Wiseman	104

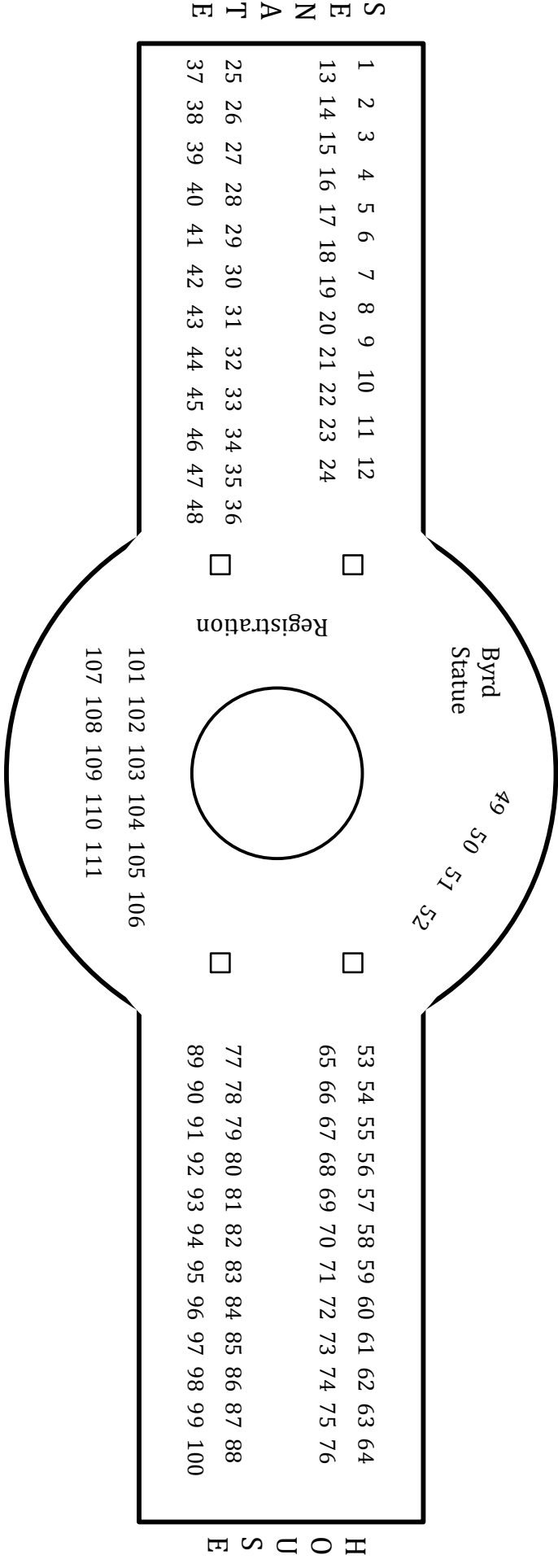
West Virginia Wesleyan College

Megan Boone	105
Kelsie Krantz	106
Emma Malcomb	107
Paige Rutter	108

Wheeling Jesuit University

Brittany Bennington	109
Mariah Cottrill	110
Jessica Pontis	111

Capitol Rotunda Layout, 2016 Undergraduate Research Day at the Capitol



1. Kaempferol induces apoptosis via extrinsic pathway in ovarian cancer cells.

Marshall Barbe (Mineral County, West Virginia)

Institution: Alderson Broaddus College

Field: Biology

Faculty advisor: Yi Charlie Chen

An estimated 14,270 women in the U.S. died of ovarian cancer in 2014, a figure which accounts for 2.4% of the total amount of cancer related deaths. Kaempferol shows much promise in being able to induce programmed cell death by up-regulating pro-apoptotic proteins. In our experiments, kaempferol was proven to reduce viability of human ovarian cancer A2780/CP70 and OVCAR-3 cells by inducing apoptosis. Kaempferol increased Caspase-3/7, -8, -9 activities in both cell lines. The expression of DR5 and Fas, two key proteins in the extrinsic apoptotic pathway, was up-regulated by kaempferol. Further study suggested kaempferol might activate extrinsic apoptotic pathway via Chk2-p53 pathway.

Funding: WV-INBRE and NIH

2. Trichodermin induces G1/S cell cycle arrest in ovarian cancer cells.

Kyle Fidler (Maryland) and Alycia Horner

Institution: Alderson Broaddus College

Field: Biology

Faculty advisor: Yi Charlie Chen

Ovarian cancer is a major health concern for women as it is prominent among gynecologic cancers. Trichodermin is a sesquiterpene isolated from *Nalanthamala psidii* and found to induce apoptosis in human chondrosarcoma cells. In this study, A2780/CP70 and OVCAR-3 ovarian cancer cell lines were treated with trichodermin in order to determine whether it had an anti-cancer effect. Our data presented that trichodermin reduced the viability of both ovarian cancer cells by inducing G1/S cell cycle arrest rather than apoptosis. The underlying mechanism might be that trichodermin down-regulated the expression of Cyclin D1 via inhibiting AhR and c-Myc. More evidences are required for this hypothesis.

Funding: WV-INBRE and NIH

3. Proanthocyanidins isolated from Chinese bayberry leaves induces apoptosis through extrinsic pathway

Christian Gongob (New Jersey)

Institution: Alderson Broaddus College

Field: Biology

Faculty advisor: Yi Charlie Chen

An estimated 14,270 women in the U.S. died of ovarian cancer in 2014, a figure which accounts for 2.4% of the total amount of cancer related deaths. Proanthocyanidins (PAs), particularly a class of polyphenols, are found in Chinese Bayberry (*Myrica rubra* Sieb. et Zucc.) leaves. In our experiments, Proanthocyanidins from Chinese Bayberry leaves were isolated. Flow cytometry was used to detect apoptotic cell quantity. Caspase Glo was used to confirm apoptosis. Our study suggested that there is a potential for proanthocyanidin in cancer treatment, specifically ovarian cancer.

Funding: WV-INBRE, NIH

4. Ultrastructure of Zebrafish Enterocytes During Lipid Absorption

Lacey Andrews (Fayette County, West Virginia)

Institution: Bluefield State College

Field: Biology

Faculty advisor: James Walters

Obesity related diseases such as cardiovascular disease, stroke, and diabetes are among the leading causes of preventable deaths within the American adult population. Over one third of American adults suffer from obesity and the related diseases. Dietary fats and cholesterol are among the biggest contributors to adult obesity, although the mechanisms behind the absorption of these dietary components are not entirely understood. The purpose of this study was to understand the cell biology within zebrafish enterocyte cells. Specifically, how the lipid droplets and mitochondria change during cholesterol absorption. Based on previous studies we predict that as the concentration of oleic acid within the zebrafish larva diet increases, the size of the lipid droplets in the enterocyte will increase. An increase in the size of the lipid droplets will then cause the mitochondria to elongate and become more closely associated with the lipid droplets. To test this prediction, different concentrations of oleic acid will be fed to seven day post fertilization zebrafish larva for three hours duration. Those larvae will then be processed for transmission electron microscopy to visualize enterocytes during lipid absorption. If the mitochondria are used for lipid processing, more mitochondria will be closely associated with lipid droplets. The size and associations of the lipid droplets and mitochondria will be quantified using NIH ImageJ. Understanding the cell biology of the enterocyte will help in the understanding of the mechanism of cholesterol absorption which may lead to better health and a reduction of cholesterol induced disease processes.

Funding: NIH

5. The Effects of Oleic Acid Concentration on Cholesterol Absorption in the Larval Zebrafish Enterocyte

Laura Stevens (Virginia)

Institution: Bluefield State College

Field: Biology

Faculty advisor: James Walters

High levels of dietary lipids are associated with dyslipidemias. The presence of fatty acids, specifically oleic acid (OA), has been shown to facilitate the entry of dietary cholesterol into enterocyte cells in the intestine. Two proposed mechanisms for signaling the uptake of cholesterol, stoichiometric or signaling, were examined. For this study we utilized the vertebrate model organism *Danio rerio*, or zebrafish. Larval zebrafish were fed diets of 1000 μM , 100 μM , 10 μM , and 1 μM OA added to low fat diets with equal amounts of native and TopFluor-Cholesterol (TF-Chl) available. After a 5.5 hour incubation, a lipid extraction was performed and the results were developed on a thin layer chromatography (TLC) with two solvent systems. TLC plates were analyzed with Gel Analyzer 2010 software to determine pixel intensity of the separation bands. Band separation allowed for distinguishing of esterified TF-Chl from unesterified TF-Chl. Analysis of relative fluorescent units (RFU) showed that 100 μM OA had the highest uptake of esterified TF-Chl. The trend of uptake between 100 μM and 1 μM appears stoichiometric. OA mediated cholesterol absorption in larval zebrafish occurs under 1 μM OA, intervals between 0 μM and 1 μM will distinguish the model of absorption.

Funding: NIH

6. Using Positive and Negative Valence Images to Affect Brain Waves

Michael Bailey (Mercer County, West Virginia) and Timothy Johnson

Institution: Concord University

Field: Psychology

Faculty advisor: Rodney Klein

Humans produce electrical pulses in their brain we refer to as brainwaves. These change based on what we are doing or feeling. Brain waves are grouped by ranges of frequencies. They are labeled Delta, Theta, Alpha, Beta, or Gamma and may be measured by an electroencephalogram (EEG). A better understanding of the brain waves in regards to their relationship to emotional states is necessary. Research has shown that over-arousal in certain areas has been linked to various mood and behavioral issues such as anger, impulsiveness, pain, ADHD, and anxiety. A portable EEG headset (NeruoSky MindWave Mobile) that is able to connect to mobile devices gave us an opportunity to examine whether positive and negative emotions affect each of the brain waves similarly and to determine the reliability of the headset. Understanding how positive and negative emotions affect the brain, and if they are similar or not, may help in understanding the biological causes of these problems. The International Affective Picture System (IAPS) at The Center for the Study of Emotion and Attention (CSEA) at the University of Florida has produced a large collection of images that reliably elicit various positive and negative emotional responses with valence scores ranging from 1.0 to 8.9 (aversive to positive, respectively). We designed an experiment in which each participant viewed one of three slideshows. Each slideshow alternated between white slides and image slides (30 of each), each image was presented for 5 seconds. The images were randomly selected to include 10 of each 1.0-2.9, 4.0-5.9, and 7.0-8.9 valence groups. Subjects wore the MindWave headset while viewing the slideshow. The subjects were 26 undergraduate students (21 female, 5 male) of the Physiological Psychology course. A repeated measure ANOVA is being used to analyze the data, examining the relationships between the various brain waves and the IAPS images of different high, medium, and low emotional valences.

Funding: Concord University Psychology Program

7. Encoding Manipulations May Result in Color Based Clustering

Katherine Engo (Mercer County, West Virginia) and Aaron Mattox (Texas)

Institution: Concord University

Field: Psychology

Faculty advisor: Rodney Klein

It has been shown that words tend to be clustered in recall based on their semantic category. A previous experiment examined if unrelated words that shared font colors would be clustered in recall based on that color as well. However, the clustering scores from the color-based groups were significantly lower than the semantic-based clustering scores. It has been suggested that manipulations at encoding may increase clustering scores. Based on this idea, the current experiment examined if color-based clustering scores increased with the addition of an encoding manipulation, in this case choice coloring. This research is ongoing and the results and implications will be discussed at a later date.

Funding: McNair Scholars Program

8. Language: Do Rats Have What it Takes?

Nicole Hash (Mercer County, West Virginia) and Randall Hash (Mercer County, West Virginia)

Institution: Concord University

Field: Psychology

Faculty advisor: Karen Griffiee

Language can be generalized to symbols, gestures, and audible sounds that correspond with physical objects or abstract ideas. The process of learning language is thought to be understood by three different, yet similar, concepts: Reflexivity, Symmetry, and Transitivity. In one example, we can confirm that a cube sitting on a table is the same as another cube sitting on a table; this concept is called reflexivity. The concept that relates the written word "BREAD" to what we know as a loaf of bread and that same loaf of bread can be communicated using the word "BREAD," is called symmetry (Devany, Hayes, Nelson, 1986). In one last example, the sound we produce when we speak the word "RED" is interpreted in both the physical sense where we visualize the color RED and as the written text form of the word "RED"; this concept is called transitivity. These three concepts together form the building blocks of language and communication, the equivalence relation. The main purpose of this study was to explore the ability to provide a learning history through training symmetrical relations to non-human subjects, in this case rats. These symmetrical relations are easy for language-able children to learn but this research is valuable to populations where this is not the case.

Funding: McNair Scholars

9. Modifying Online Python Tutor for OpenDSA Pointer Exercises

Kyle Reinholt (Monroe County, West Virginia)

Institution: Concord University

Field: Computer Sciences

Faculty advisor: Lonnie Bowe

When learning to program it is critical to receive feedback on your work. My project is concerned with providing visual feedback to students about the difficult topic of programming with pointers. OpenDSA is an online interactive textbook currently being used in introductory computer science courses at Virginia Tech. OpenDSA's programming exercises provide automated feedback to the student on whether the program is correct, but provide no visual feedback to a student about their own program. In order to fix this, Online Python Tutor (OPT), a framework for students to step through code execution, was incorporated into OpenDSA. Integrating OPT with OpenDSA required a few modifications to what parts of the program are displayed and how the data structures are laid out. With the assistance of OPT, students using OpenDSA will be able to view and step through the visualization of their submitted code.

Funding: NSF

10. Microbial Testing of Water Quality Near Marcellus Shale Drilling

Jessie Feather (Preston County, West Virginia) and Tyler Groves (Preston County, West Virginia)

Institution: Fairmont State University

Field: Environmental Studies

Faculty 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.

Funding: WV NASA Space Grant Consortium

11. Effect of UV Radiation on Anti-Markovnikov Hydrobromination of Alkenes

Tia LeMaster (Berkeley County, West Virginia)

Institution: Glenville State College

Field: Chemistry

Faculty advisor: Kevin Evans

Alkyl bromides are key intermediates in numerous multi-step organic syntheses and are commonly synthesized from the hydrobromination of alkenes. The regiochemistry of the hydrobromination of alkenes is controlled by the absence or presence of radicals. The addition of a peroxide results in a radical mechanism which yields predominately the anti-Markovnikov alkyl bromide. The objective is to develop an efficient synthesis of the anti-Markovnikov alkyl bromide by generating hydrobromic acid in situ from the hydrolysis of phosphorous tribromide. The reaction of 1-octene with phosphorous tribromide, silica gel, and benzoyl peroxide in hexanes was studied with varying reaction conditions. The peroxide promotes the desired radical mechanism, whereas, the silica gel promotes the electrophilic addition mechanism. By having conditions that result in the mechanisms competing, the effects of varying reaction conditions become more prominent. Results of the ratio of anti-Markovnikov product to Markovnikov product with varying quantities of peroxide and varying exposure times to shortwave UV radiation are discussed.

Funding: West Virginia Space Grant Consortium

12. The effect of increased temperature on the expression of ECM genes in *Aiptasia pallida*

Emily Ramezan (Gilmer County, West Virginia)

Institution: Glenville State College

Field: Biology

Faculty advisor: Sara Sawyer

The mutualistic symbiosis between many Cnidarians and dinoflagellate algae is increasingly threatened by different environmental stressors that can induce breakdown of the symbiosis, or bleaching. Using rt-qPCR to determine how increased water temperature affects gene expression of two extracellular matrix genes (matrix metalloproteinase (MMP) and collagen), two stress-sensitive genes (HSP90 and ubiquitin) and two control genes (NADH-dehydrogenase 5 (NDH5) and glyceraldehyde-3-phosphate dehydrogenase 1 (GPD1)) in the tropical sea anemone, *Aiptasia pallida*. We temperature-shocked anemones for 0, 6, and 12 hours, isolated RNA, converted it to cDNA, and qPCR was performed to measure gene expression. MMP and ubiquitin expression relative to NDH5 showed elevation at 6 and 12 hours, however when expressed relative to GPD1, MMP and ubiquitin were elevated at 6 hours, but not at 12 hours, and collagens expression was elevated at 12 hours. Thus, temperature is inducing changes in expression of the control genes NDH5 and GPD1. This was unexpected. We are investigating the relative expression of these two genes and are also investigating whether a third control gene, actin, will resolve these discrepancies. 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.

Funding: NASA WV Space Grant Consortium

13. Investigating the frequency of Wolbachia infections in West Virginia insects

Maren Wentzel (Lewis County, West Virginia)

Institution: Glenville State College

Field: Biology

Faculty advisor: Sara Sawyer

Wolbachia is a bacterial intracellular reproductive symbiont that infects the reproductive tissue of Arthropods, particularly insects. The bacteria are transmitted through the egg cytoplasm, and alter reproduction of their host. Wolbachia has been linked with male killing, where the infected males die during larval development, male feminization, parthenogenesis, and most often cytoplasmic incompatibility between infected males and uninfected females or females infected with a different bacterial strain. Because of its effects on reproductive success, Wolbachia is a suspected driver of evolution and speciation in insects. Investigations of the frequency of Wolbachia infection in insects around the world suggest that the frequency is at equilibrium and infection rates range from 20% to 65%. We are investigating the infection rates with Wolbachia in insects in central West Virginia in 2015 to determine the frequency of infection here. To investigate infection frequencies, insects were collected in the summer and fall of 2015 in wooded and meadow areas of the College Farm and Campus of Glenville State College, as well as in Lewis County surrounding Stonewall Jackson Lake. Insects were fixed in 95% ethanol and 142 of the 200+ have been identified to species to date. DNA was extracted from identified samples and Wolbachia infection was determined by using the polymerase chain reaction (PCR) using Wolbachia specific primers. Processing of these insects is ongoing and more insects will be collected. To date 22 of 49 insects tested have been demonstrated to have Wolbachia infection. To get a clear understanding of the percent of infection in this area, more insects must be collected and sampled. Determining the Wolbachia infection frequency is an important first step in understanding the impact of these bacteria on insect evolution and speciation in West Virginia.

14. Toward Tricarbonyl- η^5 -penta(4-pyridinyl)cyclopentadienylchromium(I): A New Complex for Inner-Sphere Electron Transfer and Diradical Complex Formation

Benjamin Coleman (Cabell County, West Virginia) and Jordan Martinez (Cabell County, West Virginia)

Institution: Marshall University

Field: Chemistry

Faculty advisor: Michael Castellani

Radical chemical species are often visualized as incredibly unstable and reactive compounds that can only be isolated under specific conditions, such as cooling to near absolute zero temperatures. However, previous work has seen the synthesis of metal radicals that are stable and isolatable at room temperature. These metal radicals typically have the form $[\text{C}_5\text{R}_5]\text{M}(\text{CO})_3$, where $\text{M} = \text{Cr}$ and R can be several different organic substituents such as H, methyl, or phenyl. For the case of $\text{R} = \text{H}$ and $\text{R} = \text{methyl}$, these radicals act as would be expected and react with themselves to form a dimer that has an electron configuration resembling a noble gas, but for the case of $\text{R} = \text{phenyl}$, the radical exists almost exclusively. This phenomena can be explained by imagining the C_5Ph_5 as a large umbrella that prevents the Cr core from dimerizing. The problem with this ligand is that the phenyl rings do not contain any species that can undergo further chemical reactions, and thus, limits the metal center to the primary reaction site. The first step in the synthesis of a new organic ligand, 1,2,3,4,5-penta(4-pyridinyl)-1,3-cyclopentadiene (C_5Py_5), for the formation of tricarbonyl- η^5 -penta(4-pyridinyl)cyclopentadienylchromium(I) radical is presented. Within this ligand, there are five chemically active sites corresponding to nitrogen in each of the pyridine rings. Through these nitrogens, the complex can coordinate with other species. For example, if this system coordinates to multiple other metal centers, a long chain like structure can form in which the radical electron can flow throughout the entire system, leading to conductivity, and could, therefore, be utilized in molecular wires. Furthermore, the radical will be able to form diradical complexes. Mechanistic studies of this substance could illuminate more information on other biologically-active metalloenzyme complexes, such as the oxygen-evolving complex of photosystem II. Two starting materials must be synthesized in order to afford the desired ligand; this work focuses on the synthesis of 4,4'-dipyridil diketone. 4,4'-Dipyridil diketone was produced by condensation of 4-pyridinecarboxaldehyde in the presence of potassium cyanide in an alcoholic solution, providing the material in ~70% yield. After condensation of this compound with 1,3-di(4-pyridinyl)acetone, 2,3,4,5-tetra(4-pyridinyl)-1,3-cyclopentadien-1-one can be isolated, and the fifth pyridine ring added by a lithio-reagent, followed by deoxygenation to afford the desired ligand.

Funding: Marshall University DOW-MU STEM Grant

15. Modification of Nitinol Nanoparticles with Phosphonic Acid Films

Samantha Garretson (Boone County, West Virginia)

Institution: Marshall University

Field: Chemistry

Faculty advisor: Rosalynn Quinones

Nitinol nanoparticles, which are composed of fifty-percent nickel and fifty-percent titanium, are a valuable metal alloy due to shape memory, corrosion resistance, and superelasticity. This is improved by the austenite and martensite structures that form by altering the temperature. Austenite is the form at room temperature, while martensite is found at higher temperatures. The shift between unit cell structures creates a shape memory capability in the mass metal. These qualities make the nanoparticle ideal for medical use such as self-expandable stents, braces, and eyeglasses. Eventually, nitinol is expected to be used for the production of prosthetic limbs because the nanoparticle has been found to attach to stem cells in the body, producing a naturally functioning appendage that can be controlled and sensed by the body's own nervous system. However, the presence of nickel brings concern that the substance, an allergen and possible carcinogen, could be released in the body and cause more damage. In oxidative environments, such as the human body, the nanoparticles are very reactive. Therefore, the nitinol must be treated in a way to reduce the chance of the release of a free radical. A proposed method has been the formation of a self-assembled monolayer. Here, phosphonic acids such as 16-phosphonohexadecanoic acid and octadecylphosphonic acid were used to form a film on the nitinol powder, similar to the films used on more commonly known and used metals such as steel to prevent oxidation or rust. By varying concentrations of phosphonic acid, the phosphorus content and surface coverage was altered to make the nitinol safer and less reactive in the presence of oxygen, as biomedical tools are required. These modifications were characterized by using X-ray photoelectron spectroscopy (XPS) and a scanning electron microscope with energy-dispersive X-ray spectroscopy (SEM-EDS). Furthermore, powder X-ray diffraction (PXRD) and infrared spectroscopy were used to characterize the "fingerprint" of the chemicals involved with three dimensional patterns and to identify the presence of the acid. Oxidation was characterized with cyclic voltammetry, and solid state nuclear magnetic resonance (SS-NMR) was used to analyze the attachment of the phosphorous on the surface of the nitinol. Thus far, there is evidence that the phosphonic acids are binding to the surface of the nitinol in a manner that decreases the reactivity of the nickel at the surface. With this enhancement, nitinol nanoparticles will be safer for human use.

Funding: NASA West Virginia Space Grant Consortium

16. Borderline Personality Disorder: Childhood Attachment Issues and the Connection to BPD

Krishawna Harless (Wayne County, West Virginia)

Institution: Marshall University

Field: Psychology

Faculty advisor: Mark Lindberg

Objective Of West Virginia's approximately 1.8 million residents, close to 81,000 adults live with serious mental illnesses and about 18,000 children live with serious mental health conditions (NANI, 2010). West Virginia's rate of serious mental illness among adults was higher than the national rate in 2011-2012 (SAMHSA, 2012). The purpose of this study was to examine possible causes for why some individuals develop symptoms of borderline personality disorder (BPD). Specifically, what things or conditions in an individual's background and developmental history have led to BPD as a series of coping mechanisms in development? BPD is a serious mental illness marked by unstable moods, behavior, and relationships (NIH, 2015). BPD is a malady that disrupts family life and places of work. Often BPD is thought of as one of the hardest mental disorders to treat, potentially because of its high co morbidity rate with other mental illness such as depression, anxiety, substance abuse, eating disorders, self-harm, suicidal behaviors, and completed suicides (NIH, 2015). It was hypothesized that BPD results from the interplay of adverse childhood experiences, insecure attachments and especially mixed or disorganized attachments, clinical issues, and relationship related clinical issues that create the chaotic pattern of relationships. **Methods** There were 252 participants for this research. They were college students attending an Appalachian university. Students received a large battery of tests including the 29 scales of the Attachment and Clinical Issues Questionnaire, The Adverse Childhood Events (ACE) questionnaire, as well as two measures of borderline personality disorder. **Results** Significant correlations were found between measures of adverse childhood events (ACE), attachments and clinical issues as measured by the ACIQ, and the measures of BPD with the borderd being significant against nearly every variable. The results extended previous research as well as provided several new findings. They supported the hypothesis that mixed and insecure attachments set up a series of behaviors to cope with stress in the short term, but then develop into maladaptive behaviors as they move out of the family system. **Discussion** Many problems currently exist with the DSM and treatment for BPD. To date borderline is classified as a personality disorder which implies the individual is in control of their symptoms and their disorder and could ultimately be faking their issues (Aviram, Brodsky, & Stanely, 2006). These results help to reconsider more focused forms of therapy where diagnosis of specific clinical issues is taken as axiomatic.

17. Insecure Attachment Patterns, Adverse Childhood Events, and Clinical Issues: Necessary Conditions in Developing Psychopathologies

Krista Harris (Raleigh County, West Virginia)

Institution: Marshall University

Field: Psychology

Faculty advisor: Marc Lindberg

Objective According to the Substance Abuse Services and State Mental Health Services Administration (2013), West Virginia spends about 155.5 million dollars a year on state mental health agencies. This cost could be reduced by utilizing new approaches to create more effective treatments. The National Institute of Mental Health (2013) has recently suggested replacing the American Psychiatric Association's Diagnostic and Statistical Manual's (DSM) method of diagnosis with a newer diagnostic system based on Research Domain Criteria (RDoC). This is because the DSM diagnoses do not lead to specific treatments. The notion here is that if you can't diagnose something well, then it is more than difficult to treat. The purpose of this study was to test whether insecure attachment patterns, which are part of one of the more important social RDoC domains, and related clinical issues are necessary conditions for the development of several different forms of psychopathology (substance abuse, anorexia, binge-eating, borderline personality disorder, anxiety, depression, and criminal behavior). If found, these patterns could indicate that the attachment domains should be a focus of treatment in clinical trials for all these types of disorders.

Methods The participants were 624 volunteer undergraduate students enrolled in introductory psychology courses at an Appalachian university. The data of 133 participants could not be included in the analyses for various methodological reasons, therefore 491 could be entered into data analysis. These participants were given multiple questionnaires including the ACIQ (Attachment and Clinical Questions Questionnaire) and Adverse Childhood Events Questionnaire (ACE). In addition, scales were used to measure several different forms of psychopathology, such as substance abuse, anxiety, binge-eating, anorexia, measures of criminality, depression, and borderline personality disorder.

Results The results showed scales measuring insecure attachments, a variety of clinical issues, and adverse childhood events all correlated similarly with all of the maladies tested. We are using a discriminant function analysis to test what variables best discriminated between the different disorders, and these results will be presented at the conference.

Discussion The present data suggested that binge-eating, anorexia, substance abuse, depression, anxiety, borderline personality disorder, and criminal behavior are actually fairly similar in terms of the treatment domain of insecure attachments. According to this view, insecure attachments set up aberrant patterns of coping, and these patterns represent different ways of dealing with stress and insecurity. It was concluded that these patterns, when properly diagnosed, provide a more substantial and exacting diagnosis for effective treatments.

18. DNA Origami Platform for Protein Presentation

Andrea Hensley (Cabell County, West Virginia)

Institution: Marshall University

Field: Chemistry

Faculty advisor: Michael Norton

Many modern diagnostics for protein analysis, including tests for various infections, rely on fluorescence. The purpose of this project is to precisely position single molecules of a model protein for optical detection using fluorescence. The project uses a cross shaped DNA origami as the platform for positioning the protein Dendra2. Dendra2 is used because it is photoactivatable; its signal can be converted from one wavelength to another. Proteins binding on the origami are observed using atomic force microscopy (AFM). AFM imaging uses a small probe to tap along the surface of a sample and determines topography. Based on the results of AFM, the ideal ratio of DNA to protein can be determined to optimize binding while reducing the number of unbound molecules observed on the mica substrate. It is important to reduce the background protein or extra protein because optical microscopes have a resolution limit that makes multiple nearby proteins nearly impossible to distinguish. With the eventual goal of making a biosensor, individual molecules should be optically observable. Therefore, gold nanoparticles are proposed to enhance the detection of the fluorescent protein bound to the DNA origami, and their placement will be the focus of future studies. The methodology used in this project includes DNA folding, protein harvesting and AFM imaging. A DNA origami platform is made using the M13 circular DNA plasmid as a scaffold. The DNA is folded using staple strands that are annealed with the scaffold to form a cross shape. Four staples, two on both the left and right arms, in the cross are biotinylated to bind the linker protein streptavidin. The next step is to introduce the protein, biotinylated Dendra2. To do this, a biotinylated mutant of Dendra2 is reacted with streptavidin and purified via gel electrophoresis. Since streptavidin has four binding sites, it can easily bind to one Dendra2 molecule and to one staple in the origami. Once the Dendra2-streptavidin complex is formed, it can be introduced to the DNA origami. At a ratio of one protein binding site to twenty-five protein complexes, the DNA origami displays nearly 100% protein site occupancy, as determined by AFM imaging. Experiments are being conducted to optically detect these single molecules of Dendra2 on the surface of DNA origami.

Funding: NASA West Virginia Space Grant Consortium

19. Increasing lipid accumulation in *Chlorella vulgaris* to improve biodiesel production

Aaron Holland (Cabell County, West Virginia) and Paris Adkins (West Virginia), and Amanda Smythers

Institution: Marshall University

Field: Chemistry

Faculty advisor: Derrick Kolling

A finite supply of fossil fuels leaves the United States with an increasing need to diversify its energy portfolio. Microalgae has the ability to grow in a variety of conditions, including in salt or fresh water, with or without light, and even in waste water that might be contaminated with heavy metals, making it a promising prospect as an alternative fuel source. Research suggests that microalgae is more efficient at photosynthesizing than other agricultural fuel sources. Corn-grain-based ethanol, a popular biological feedstock, would take 40 acres to meet the energy demands compared to 1 acre of microalgae. In the Kolling Lab at Marshall University, researchers work with *Chlorella vulgaris*, a high-lipid-producing microalgae, in order to increase the lipid production per algal cell. Previous and ongoing experiments have utilized glycerol addition and nitrogen deprivation to increase lipid yields with measurable success. These experiments sought to increase production of triacylglycerols, which are high-energy-yielding lipids that are key components of biodiesel. The Kolling lab is also conducting several experiments to gain a better understanding of the anabolic metabolism of *C. vulgaris*. One such approach uses a fluorometer to determine which mode of photosynthesis the algae use under various conditions. This will give insight into how metabolic products are formed and how *C. vulgaris* metabolism may be manipulated to increase lipid production. Another approach concerns exposing the algae to elevated levels of glycerol in an attempt to produce more triacylglycerols by increasing metabolic flux in relevant pathways. By exposing cells to low glycerol concentrations early in the growth cycle, we seek to increase the number of glycerol transporters. We expect that this will increase the intracellular concentration of glycerol, thus favoring formation of triacylglycerols. Lastly, an additional experiment is to force *C. vulgaris* to undergo directed evolution that will allow it to survive herbicide poisoning via elevated production of lipid producing enzymes. If successful, the modified algal culture can be used to produce more triacylglycerols. Kolling Lab is located in the state-of-the-art Weisberg Family Applied Engineering Complex at Marshall University and is supported by a variety of funding sources including the National Science Foundation, the Summer Undergraduate Research Experience, West Virginia NASA Space Grant Consortium, among others.

Funding: Marshall University

20. A New Turn?: Political Realities of the Immigration Debate in the 2016 Presidential Election

Sophia Mills (Ohio)

Institution: Marshall University

Field: Political Science

Faculty advisor: Damien Arthur

During the last decade, the political rhetoric pertaining to comprehensive immigration reform has increased, both in terms of its pervasiveness among policy-makers and the vitriolic tone aimed at the current system (Arthur & Woods, 2013; Woods & Arthur, 2014). This trend has been documented in both the sociological and political science literature (Andreas, 2002; Boza-Golash, 2012; Branton & Dunaway, 2009; Gottschalk, 2014; Monogon, III, 2013; Ybarra, Sanchez, and Sanchez, 2015). In the same vein, our research offers an overview of the changes in the immigration debate from the beginning of the Obama Administration through the run-up to the 2016 presidential election. Utilizing the American Presidency Project, we coded every remark pertaining to immigration reform from January 20, 2009 through December 31, 2015 with with different categories of negativity: illegality, criminality, terrorism, and economic threats as well as other important controls such as geography and political party. In building a substantial database on the discussion of immigration reform in presidential rhetoric, we offer an analysis of the notion of 'reform' and how it follows the political realities impeding such policy changes, from President Obama's agenda throughout his Administration to the current Republican presidential candidates' rhetoric and policy proposals. After outlining the necessity of 'reform' as a political maneuver for persuading the growing Hispanic electorate, the discussion considers the changes in campaign rhetoric pertaining to immigration in both the general elections as well as the primary elections. This analysis enables us to offer a discussion of the current Republican Party primary, wherein the rhetoric of the establishment candidates want a more inclusive approach to the increasingly electorally powerful Hispanic demographic. Nevertheless, we find, the rhetoric gaining the most attention comes from those candidates leading the polls, those who are using rhetoric that calls for limited immigrant participation in civic life. We then offer a speculative discussion as to the effect such rhetoric will have on the Republican Party nominee and their ability to navigate the general election in 2016.

21. On Sets of Cardinality 2 of Nondecreasing Diameter

Adam O'Neal (Wayne County, West Virginia)

Institution: Marshall University

Field: Mathematics

Faculty advisor: Michael Schroeder

Our problem comes from the field of combinatorics known as Ramsey theory. Ramsey theory, in a general sense, is about identifying the threshold for which some object, defined by a particular parameter, goes from never or sometimes satisfying a certain property to always satisfying that property. Research in Ramsey theory has applications in design theory and coding theory.

For integers m , r , and t , we say that a string of n integers colored with r colors is (m, r, t) -permissible if there exist t monochromatic subsets B_1, B_2, \dots, B_t such that (a) $|B_1| = |B_2| = \dots = |B_t| = m$, (b) the largest element in B_i is less than the smallest element in B_{i+1} for $1 \leq i \leq t-1$, and (c) the diameters of the subsets are nondecreasing.

Consider the following example. Suppose we have a string of length 10 using two "colors" a and b : $bbabaababb$. Let $B_1 = \{1, 2\}$, $B_2 = \{3, 6\}$, and $B_3 = \{7, 10\}$. Note that the colors in entries 1 and 2 match, 3 and 6 match, and 7 and 10 match. So B_1 , B_2 , and B_3 are monochromatic, each with cardinality 2. The largest element in B_1 is smaller than the smallest element in B_2 . Likewise, the largest element of B_2 is smaller than the smallest element in B_3 . The diameters of B_1 , B_2 , and B_3 are 1, 3, and 3 respectively, so their diameters are nondecreasing. Therefore, this string is $(2, 2, 3)$ -permissible.

Define $f(m, r, t)$ to be the smallest integer n such that every string of length n is (m, r, t) -permissible. We begin by fixing $m = r = 2$ and show that $f(2, 2, t) > 5t - 5$ and $f(2, 2, t) \leq 5t - 2$. We conjecture that $f(2, 2, t) = 5t - 4$ and prove the conjecture in certain cases. We conclude by investigating colorings with more than two colors.

Funding: Marshall University Department of Mathematics

22. Operating Room Door Traffic Monitoring and Modification System

Katarina Richards (Wirt County, West Virginia), Scott Taj (Cabell County, West Virginia)

Institution: Marshall University

Field: Computer Sciences

Faculty advisor: Paulus Wahjudi

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 may increase 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. The goal of this project is to develop an electronic device to gather data on operating room door traffic. The data being collected will include the time when the door was opened and for how long. In order to achieve data collection, these sensors will be custom built to detect changes in the door state. Moreover, a microcontroller uses custom software to interpret data from the magnetic reed switch while the a connected WiFi shield pushes the data out. The data is transmitted after every door opening and is time stamped by the remote server. This data can then be compared to patient records to determine if a higher frequency of door openings during an operative case increases the risk for surgical site infection. The device will also feature a graphical display, giving surgical staff real-time feedback on the level of door traffic. This tool will provide meaningful data in on door openings so that policies and procedures can be made that reduce foot traffic in and out of the operating room. Moreover, there will be increased production of these sensors so that multiple rooms can be monitored for more effective data collection and analysis.

Funding: DOW-Marshall University

23. Polymorphism: Changing Active Pharmaceuticals by Surface Modification

Noah Searls (Mason County, West Virginia)

Institution: Marshall University

Field: Chemistry

Faculty advisor: Rosalynn Quiñones

Pharmaceuticals have experienced a recent uproar in problems regarding polymorphism, which is simply put the ability to for molecules to alter their physical and chemical structures. These conformational changes affect the adjoining between neighboring molecules of the drugs' crystalline structure, or crystal lattices. By revising repeating array of the new unit cell, the internal energy, or lattice free energy, varies, which determines to stability of the compound. The stability influences the drugs' solubility. This crucial factor plays one of the main roles in regards to absorption, secretion, and site of activity of pharmaceuticals. Therefore, the interactions between the compound and the human body will vary upon physical variance, which has led to drug recalls. The method used to develop and reproduce polymorphs was surface modification. Surface modification was developed by using a metal stage, self-assembling monolayers (SAMs), and common consumer pharmaceutical drugs. Nickel was chosen as the metal stage due to its sensitivity to chemical reaction. SAMs were crafted by using an organic acid, either sulfonic or phosphonic acids, with highly electronegative "head" groups attracted to the positively charged nickel tiles, hence creating an uniform monolayer. Pharmaceutical drugs, including Cimetidine ($C_{10}H_{16}N_6S$), Tolfenamic Acid ($C_{14}H_{12}ClNO_2$), and Flufenamic Acid ($C_{14}H_{10}F_3NO_2$), were applied to the reformed surface through different thermodynamic procedures to alter the kinetic energy and nucleation for recrystallization. Intermolecular bonds, especially hydrogen bonding, between the SAM and the pharmaceutical drugs generated forces needed to pull the molecules in certain areas to alter its shape. The study has been successful by revealing two forms of Cimetidine and Tolfenamic Acid, with three forms of Flufenamic Acid, including their commercial forms. The polymorphs from each drug were reproduced and characterized by a series of instrumental testing through infrared spectroscopy, powder X-ray diffraction, and Raman spectroscopy. The analysis reveal the expected results of differences between polymorphs being shown in the hydrogen bonding area of the spectra. In addition to the physical difference, solubility was tested for chemical property comparison. Cimetidine was studied under ultraviolet-visible spectroscopy, which corresponds to the drug's solubility concentration in the solvent. The results demonstrated the vital chemical differences between polymorphs. Ultimately, the project revealed how active pharmaceutical compounds may alter their physical structure when applied to a reformed surface, whether that's during manufacturing or transportation, by using surface modification that will lead to new chemical properties for each compound.

Funding: NASA WVSGC, MU-DOW Research Fellowship, and Marshall University Research Corporation

24. Effects of Readily Available Information on the Rates of Relapse

Olivia Shreve (Jackson County, West Virginia)

Institution: Marshall University

Field: Psychology

Faculty advisor: Marc Lindberg

Abstract **Objective** The disease of addiction costs West Virginia \$1.86 billion annually (Hall, Hawkinberry, Moyers-Scott, 2010), including costs to provide for addicted prisoners and foster care for children of these addicts, and is therefore viewed as a societal issue (McLellan, Lewis, & O'Brien, 2009). Addiction is not a behavioral problem but a chronic illness (McKay, Alterman, McLellan, & Snider, 1994) and is plagued by high levels of stigma. (Link, Struening, Rahav, Phelan and Nuttbrock, 1997) These two factors combine to create a climate wherein many communities do not a) have widely advertised services, and b) have poorly coordinated services that jeopardize continuity of care. It was the purpose of this project to rectify this situation in the Huntington area by first locating all the agencies providing different kinds of treatment in the area, organizing them in terms of type and focus, and then publishing a document in brochure form for hospitals, all treatment facilities, emergency responders, and other groups to help coordinate treatment. This is designed to be used to help the addict who seek treatment by providing all the alternatives in this area, and then for the agencies themselves to be sure that their clients move to a next level of treatment because one of the best predictors of relapse is cessation of treatment. **Methods** In the Community forums led by Laura Gillian and Jessica Pressman, the first group of treatment providers was identified. We then surveyed these individuals and agencies to try and include all treatment agencies dealing with addiction and recovery in the area. From this, we attempted to create an easily readable pamphlet to provide to the community that included basic information about the different kinds of services provided by local agencies. It was therefore the purpose to provide a pamphlet to serve as a roadmap for addicts to begin their care and help with continuity of care for this chronic disease. **Results** See Brochure. **Discussion** By making this information in a more readily available format for all areas, there should be an increase in continuity of care and cooperation across agencies. In having a patient focused goal, relapse rates should steadily decline.

25. The Thermal Decomposition of 4-Nitrosooxy-2-butanone

Eric Sias (Ohio)

Institution: Marshall University

Field: Chemistry

Faculty advisor: Laura McCunn

Radicals are a highly reactive species of compounds that have an unpaired electron. Radicals may participate in atmospheric reactions as well as combustion processes and may even lead to pollution. It is vital to study radicals in order to comprehend their structure and reactivity. The goal of this project is to create and isolate the acetonyl radical and acquire a complete vibrational spectra of the radical. The acetonyl radical is thought to be produced through the thermal decomposition of 4-nitrosooxy-2-butanone in an oxygen free environment. The thermal decomposition of 4-nitrosooxy-2-butanone was performed via a pyrolyzer, where a small sample of 4-nitrosooxy-2-butanone was mixed with argon gas in a ratio of 1:250 (sample to argon) and sent through a heated silicon carbide (SiC) tube. The mixture was pulsed through the SiC tube at a controlled rate and allowed to decompose. Pyrolysis was performed at temperatures ranging from 600 – 1000 K. The pyrolysis products were then sprayed onto a cesium iodide (CsI) window that was cooled to 15 K. The products were frozen and isolated in an argon matrix on the CsI window and analyzed using matrix isolation Fourier-transform infrared (MIFTIR) spectroscopy. The initial products found were formaldehyde and ketene. The presence of formaldehyde suggests that the sample of 4-nitrosooxy-2-butanone decomposed via a pathway producing the acetonyl radical, formaldehyde, and a nitric oxide radical. The presence of ketene suggests that the acetonyl radical continued to decompose. Computational chemistry was employed to determine where the carbonyl stretch of the acetonyl radical would appear in the MIFTIR spectrum. There was some evidence of absorption in the carbonyl stretch region of the spectra, though not where the computational chemistry predicted.

Funding: NASA West Virginia Space Grant Consortium

26. The Pythagorean Proposition Project

Emilie Piatek (Berkley County, West Virginia) and Bradley Davidson (Maryland)

Institution: Shepherd University

Field: Mathematics

Faculty advisor: Karen Adams

The Computer Science, Mathematics, and Engineering (CME) Department at Shepherd University (SU) is excited to continue the Pythagorean Proposition Project, a collaborative project by CME students to digitally visualize selected proofs of the Pythagorean Propositions by E. S. Loomis (1940 2nd ed.). The book includes over 300 different proofs of the Pythagorean proposition. The text is written to follow the manner of the original proof by authors such Copernicus, Descartes, Euclid, Galileo, Gauss, Leibniz, Lobachevsky, Napier, Newton, Pythagoras, and Sylvester; thus, is difficult to read in terms of the typesetting and the few illustrations that are included are primitive. The Pythagorean Propositions Project began in 2013. Students created a web friendly environment using html and LibreOffice Draw. Each proof is stepped through mathematically with a visual representation displayed concurrently. The outcome is an enhanced presentation of classic proofs that lead to improved understanding. Proofs from the Algebraic and Geometric domains have been completed. Work continues in the Quaternionic and Dynamic domains. The web pages also include links to historical references, biographic information, and teaching/learning opportunities. One goal of the project is to enrich the understanding of mathematics through visualization. Multiple representations have been shown to improve the comprehension and retention of information. The projects' dual display naturally enhances the connection between mathematical writing and visualization. A second project goal is to encourage students, particularly females, to enter and persist in STEM fields. The U.S. Department of Labor predicts that 9 out of the 10 fastest growing careers that require a bachelor's degree will require significant training in mathematics and the sciences. In order to develop a strong workforce in the United States, more students must enter STEM fields. Research has shown that the greatest difference in academic performance between genders is in mathematical reasoning and geometry. The Pythagorean Proposition Project aims to increase both mathematical reasoning and special development among all students. A third goal is to support mathematics education in grades 5-12. Many of the proofs will include links to historical references, biographical information and classroom activities designed for teachers.

Funding: NASA WVSGC

27. Import Mechanisms of MicroRNA-378 into Cardiac Mitochondria

Shruthi Sreekumar (Monongalia County, West Virginia),

Institution: Shepherd University

Field: Biology

Faculty advisor: John Hollander

In Type 2 diabetes mellitus, cardiac complications are the leading causes of morbidity and mortality. Diabetes currently affects about 9% of the U.S. population and 347 million people worldwide. It is especially concerning because West Virginia has one of the highest cases of individuals over the age of 20 diagnosed with Type 2. Cardiac complications related to diabetes include heart disease, atherosclerosis, stroke, hypertension, and kidney disease. Mitochondria in heart cells are crucial for proper heart function as the heart depends on optimum ATP output by its mitochondria to ensure proper function in order to pump blood to oxygenate all the organs of the body. While mitochondrial dysfunction has been well characterized in diabetes, the recently discovered mitochondrial microRNA's role in mitochondrial function is not well understood. MicroRNAs are small non-coding RNAs that can regulate mRNA stability and translation for protein synthesis. Recent studies have identified differential mitochondrial expression of microRNA 378 (miR378) and its ability to regulate mitochondrially-encoded proteins in diabetes mellitus. Studies that have investigated mitochondrial microRNA contents have only hypothesized the mechanisms of import of these small RNAs into the organelle. Therefore, the expression of miR378 in mitochondrial subpopulations during type 2 diabetes mellitus and the microRNA import mechanisms are not well understood. We hypothesize that miR378 is dysregulated in type 2 diabetes mellitus and microRNA import mechanisms utilize proteins responsible for miRNA import. Studies were conducted in mouse cardiomyocyte cells that were overexpressed with four proteins (Translocase of the Outer Membrane 40 (TOM40), Translocase of the Inner Membrane (TIM23), Glucose Regulated Protein 75 (GRP75), and Polynucleotide Phosphorylase (PNPASE) which are involved in RNA import mechanisms. Cellular fractionation was conducted by differential centrifugation and qualitative RT-PCR was utilized to quantify the miR378 concentration in the cytosol and mitochondria. Overexpression of proteins was verified by Western blots. Our data show that the overexpression of PNPASE and TOM40 increased the concentration of miR378 in the mitochondria. By understanding the miR378 import mechanism, studies can be conducted to find ways to regulate miR378 import within the mitochondria through the development of drugs in hopes to normalize cardiac function in diabetic individuals.

28. The Effect of Exotic Invasive Plants on Native Plants in Different Environments

Lindsay Clark (Kanawha County, West Virginia)

Institution: University of Charleston

Field: Biology

Faculty advisor: Mark Watson

Exotic invasive plants are described as a plant species that is not native to an area. They tend to become genetically modified as they adapt to the new environment allowing them to succeed the native species in the given area (Maron, Vila and Bommarco). This issue plays a major role in Appalachia because of the location in the United States. Different studies throughout time have been done to determine how these species were introduced to the United States via immigrants. These different exotic invasive species are said to have been introduced purposefully in the east and accidentally in the west (Ricklefs, Quinfeng and Quian). Many times an invasive plant species is able to grow so productively because of their phenotypic plasticity. When observing the fitness of native vs. invasive in different conditions, the majority of the time invasive succeeds because they are more plastic in desired conditions. When placed in undesirable conditions they tend to be less plastic allowing native plants to be successful (Davidson, Jennions, Nicotra, 2011). A quantitative analysis was done to examine the number of exotic invasive species vs. the number of native species in an environment using a quadrat to determine if an exotic invasive species would be more prevalent in a desired condition; like an open field. Four different samples from three different environments; woodland, open field, and river bank, were obtained to represent the ecological diversity in Appalachia. The data was collected and analyzed through a series of chi-squared tests to determine if there is a significant difference between the environments. The results did not support the hypothesis in providing evidence that there is no significant difference with a $p < 0.05$. Further research would need to be done to determine why there is no significant difference and if their effect on native species adaptation is a result on the type of environment they are growing in.

29. Music Genre: Effects on Memory Recall

Alexandria Fisher (Putnam County, West Virginia)

Institution: University of Charleston

Field: Psychology

Faculty advisor: Michael Bayly

The Mozart Effect, which is the idea that classical music enhances performance, has been the focus of much research (e.g. Rauscher, 1999, Heidling, 2014, Wilson & Brown, 1997); however, it has not been extended to modern music. The purpose of the study will address whether the genre of music playing while completing a task will positively or negatively affect the participant's performance. The study is set up in a 2 X 4 factorial design; the data will be displayed as male and female participants and their performance scores in the four conditions of the study. The genre of music played will serve as the independent variable: there will be four conditions: rock, country, rap, and no music played which will serve as the control group. The genre of music playing, if any, while the participants are reading the short story will serve as the manipulation. The participants will read a short story and complete a post questionnaire regarding the short story. Participants' performance scores on the post questionnaire serve as the dependent variable. It is predicted that music will have an overall negative effect on productivity because modern music often contains words which could interrupt the thought process in recalling information about the short story; this effect will be more present in males than females. Students will be recruited from various psychology courses offered at the UC-Charleston campus. At the beginning of the study, students will be asked to complete the informed consent form. Next, directions will be given to participants for their first task to read the short story provided in the folder. They will be instructed to complete the tasks to the best of their abilities. Participants will be given time to read a short story while the genre of music randomly assigned to that group is playing. After all participants have finished reading, participants will be asked to complete a post questionnaire regarding the story they had read. Students will not be allowed to go back and search for answers in the story. Potential implications of this study include better understanding of differences between males and females in the ability to multitask and information about how space environment can impact productivity either positively or negatively. These implications can also be extended to cases of listening to music while driving or other activities that should require absolute focus.

30. Opioid Abuse Effects are Potentially Mediated by Epigenetic Mechanisms

Ana Maria Pena Castro

Institution: University of Charleston

Field: Biology

Faculty advisor: Philippe Georgel

Huntington and other areas in southern West Virginia have a high rate of opioid abuse; one particular concern about this population is related to pregnant women using opioids and the deleterious effects on the fetus during development. Initial studies suggest a potential relationship between epigenetic modifications and the Neonatal Abstinence Syndrome (NAS). Buprenorphine is an opioid used to treat withdrawal symptoms in newborn babies from drug-abusing mothers. This pharmacological drug binds to specific opioid receptors that trigger cognate signaling pathways that can lead to morphological or behavioral changes. The purpose of this project is to confirm and investigate the potential epigenetic connections induced by opioid exposure, and their subsequent effects. We will focus our epigenetic profiling on post-translational modifications (PTMs) of histone proteins and chromatin composition. In order to investigate these connections, we treated rat brain micro-vascular endothelial (RBMVE) cells with 50 ng/mL of buprenorphine for a 48-hour period, a dose close to that found in the blood of umbilical tissue of affected neonates in southern West Virginia. We have used western blots to check for presence of histone modifications such as acetylation and methylation. We used Lamin B1 (a nuclear protein) and unmodified H4 to normalize the amount of protein. Our results suggest that opioid exposure can indeed affect the cells epigenetic profile. As the effects of opioids on chromatin structure/composition remain understudied; these results are the first step to understand the epigenetic mechanism of action of Buprenorphine (BUP) and how this can affect the development of the newborns.

Funding: WV INBRE

31. Influence of Authority Figures on Academic Performance

Cassandra Richards (Roane County, West Virginia)

Institution: University of Charleston

Field: Psychology

Faculty advisor: Martha Spiker

According to research by Mayhew and Murphy (2014), participants are more likely to experience increased stress levels when an authority figure is present. In other words, the authority figure can greatly influence the behavior of the participants negatively. Stoliker and Lafreniere (2015), suggest that stress levels have adverse effects on a participant's ability to achieve the intended goal. The idea of the current study is to determine if the presence of an authority figure influences the performance of participants on an academic task. At the beginning of the study the students will be randomly assigned to one of the two groups. The experimental group will receive oral instructions from a confederate female authority figure. The control group will receive written instructions in their folders to read without the presence of the confederate. Once the instructions are read or heard, the participants are asked to complete the academic task containing 10 ACT English questions and 10 ACT Math questions. The academic task will end at the 20 minute designated time limit. At the conclusion of the task, the participants will be given a demographic questionnaire with questions regarding age, gender, ethnicity, year in school, and self-reported GPA ranking. It is expected that the experimental group will have lower scores than the control group. Thus, academic performance will decrease when the authority figure is present as opposed to when the authority figure is absent.

32. Interventions to Reduce the Nephrotoxic Effects of Cisplatin

Natalia Sklioutovskaya-Lopez (Mercer County, West Virginia)

Institution: University of Charleston

Field: Biology

Faculty advisor: Mark Watson

Cisplatin, a cancer chemotherapy drug, is prescribed for treating breast, ovarian, testicular, colorectal, and small cell lung cancers. A serious adverse effect associated with cisplatin is nephrotoxicity. Approximately one in three patients treated with cisplatin eventually develop nephropathy that targets the proximal and distal tubules of the nephron of the kidneys. Cisplatin cell damage is mediated by cisplatin binding to DNA and proteins causing mitochondrial dysfunction, oxidative stress and cell death. Resveratrol (RES), a naturally occurring compound found in blueberries and grapes, has several anticancer properties and can reduce oxidative stress especially in noncancerous cells. Previous work on this established that RES can reduce cisplatin nephrotoxicity. This project further explored the cellular mechanism of RES protection for cisplatin using HK-2 cells, a human noncancerous kidney proximal tubular epithelial cell line. HK-2 cells were grown for 48 h and then pretreated for 1 h with RES followed by a 24 h co-incubation with cisplatin. The vehicles were dimethyl sulfoxide and water for RES and cisplatin, respectively. RES reduced cisplatin mediated loss of cell viability as measured using a cell viability test, the MTT assay. Caspase 12 cleavage was examined as an indicator of endoplasmic reticulum (ER) stress. Protein carbonylation, an oxidative stress indicator, was increased by cisplatin. But RES prevented cisplatin mediated oxidative stress even at the high concentrations of cisplatin. Our results indicate that RES extensively reduced oxidative stress associated with cisplatin in HK-2 cells. The results also suggest that caspase 12 cleavage was induced by cisplatin and prevented by RES.

Funding: National Institute of Health

33. Recidivism and Tax Dollars: A Trend Analysis

Luke Yingling (Cabell County, West Virginia)

Institution: University of Charleston

Field: Political Science

Faculty advisor: Kara Fisher

With the rate of recidivism among drug offenders continuing to escalate, it has become apparent that rehabilitating rather than incarcerating offenders convicted of drug related crime is a more effective long-term solution. According to the National Institute of Justice, incarceration expenses are the second most costly line-item on state budgets. On average, it costs upward of 31,000 dollars per year to incarcerate an inmate in the United States (Jacobson, 2012). As evidenced by the Obama Administration's commitment to break the cycle of drug use, crime, and incarceration, many believe that current practices are a poor allocation of tax-payer dollars for a solution, which often only lasts the duration of the inmate's prison term. The current national rate of recidivism among drug offenders has soared to 76.9% (Durose, Cooper, Snyder, 2014). This inquiry will examine the outcomes of an alternative method to incarceration that involves a separate court with the power to expunge charges from a criminal's record, should they show adequate progress toward rehabilitation and abide by the standards of the court. Through the inclusion of secondary data collected by The National Institute of Justice, Pew Research Center, and Cabell-Huntington Adult Drug Court (West Virginia), I will conduct a comparative trend analysis to observe the rate of recidivism and cost for drug courts compared to incarceration, over a period of 10 years. This longitudinal study examines the relationships between program costs and recidivism compared to incarceration costs from 1991-2001 in Portland, Oregon in relation to current data collected through the Cabell-Huntington Adult Drug Court. Preliminary aggregate data analysis suggests that for every county in which a drug court is introduced, recidivism declines significantly. Long-term cost benefit analysis of these programs range up to several thousand dollars per offender processed compared to the much higher costs of incarceration and recidivism rate in that same county. Citations: Recidivism. (2014, June 17). Retrieved from: <http://www.nij.gov/topics/corrections/recidivism/pages/welcome.aspx> Durose, Matthew R., Alexia D. Cooper, and Howard N. Snyder, Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010 (pdf, 31 pages), Bureau of Justice Statistics Special Report, April 2014, NCJ 244205.

Funding: University of Charleston

34. Water Analysis of the Ohio River and Streams in the Northern Panhandle of West Virginia

Emily DeTemple (Ohio County, West Virginia)

Institution: West Liberty University

Field: Chemistry

Faculty advisor: Douglas Swartz

The purpose of this study was to analyze specific water systems in the northern panhandle of West Virginia for chemicals that can be associated with coal mining, the steel industry, and hydraulic fracturing processes. Since these industries are prevalent in the region, many residents in the northern panhandle of West Virginia are concerned about the health and impact these industries may have on natural water sources. A baseline of chemical data for rivers and streams in the northern panhandle was established 2014 that includes chemical concentrations of sulfate, chloride, and manganese. In addition, general chemistry parameters that include data on pH, conductivity, turbidity, and alkalinity were also collected. The baseline data established in 2014 was compared to the results gathered in the summer of 2015. This study provides a snapshot of the chemical health of river and streams in the northern panhandle of West Virginia and lays the necessary foundation for tracking these chemical concentrations for years to come

Funding: WV EPSCoR

35. Feasibility and Design of a Bubble Column CO₂ Capture Unit Utilizing Microalgae

Jon Ball (Boone County, West Virginia) and Joel Kouakou (Illinois)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihi

In recent years, governments have become increasingly aware of their country's carbon dioxide (CO₂) emissions. This awareness has resulted in an increase of government regulations in industry, leading to the need for a carbon capture system (CCS) to keep up with the ever-increasing government standards. This report focuses on the use of photobioreactors, a much less explored, more environmentally friendly approach to managing the issue and reducing industrial CO₂ emissions. The contents of this paper include research conducted in the field of photobioreactor (PBR) and their effectiveness at using micro-algae to absorb CO₂. Time was spent determining the feasibility of creating a small scale PBR with the goal of real world experimentation in mind. Different types of PBRs were researched and compared to determine which one would be more promising to work with throughout the course of this project. The PBRs compared were vertical column, flat panel, tubular, and internally illuminated. Comparing these types of reactors to one another resulted in the choice of a vertical column PBR. It was found that though reactors such as the tubular were more efficient at absorbing CO₂, they are typically more complex and require more input power than vertical column or flat panel. Also, compared were different types of algae, a main component with biophysical properties needed in this project. This was originally more challenging than expected because of limited knowledge in microbiology. Two well researched genus of algae were then compared: Spirulina, and Chlorella. It was determined that they are both easily acquired, and generally undemanding with respect to the environment. These factors made them ideal for use in the desired system. A decision making matrix was therefore used to determine that Chlorella would be the appropriate genus. Similar processes were applied to evaluate different types of materials that will be used in the PBR's main structure and pinpoint a manufacturing process best suited to the project requirements. A 3D printer will be used to produce PBR components, irregular parts, and hardware housings for temperature and CO₂ sensors.

Funding: WVU Tech Engineering Department

36. Nelson Tank Lime Neutralization of Mine Acid Drainage at the Morris Creek Watershed

James Coffman (Fayette County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Winnie Fu

Acid mine drainage is a leading problem to creeks and small communities throughout the coal mining regions of the world. The effects of acid mine drainage includes restricted stream use, contaminated drinking water, and loss or disruption of growth or reproduction in aquatic plants and animals. Due to the vast numbers and locations of these problem areas, funding is not available to the small communities to address or maintain the acid mine drainage problems. One way to treat mine acid drainage is to implement a lime neutralization method which involves no more than limestone fines, mixing tank, and settling ponds. This project focuses on raising the pH of the mine acid drainage at the Morris Creek Watershed upper stream #3 site by increasing the water velocity in a 500 gallon water tank that mixes the acid mine drainage and limestone fines. The tank currently satisfies many of the project goals including low cost, low maintenance, negligible energy requirements and target pH levels of 4.0; current readings taken around the tank discharge and surrounding mitigation phones are approximately 3.9. This project is ongoing. After the 500 gallon water tank was installed, the flow rate of the acid mine drainage decreased to a very low 15 gallons/minute, compared to the previous average of 40-80 gallons/minute, lowering the potential effectiveness of the tank. A more thorough investigation is currently being performed to better understand the variability of drainage flow rate. A future project aims to improve more than just the pH level. Increasing the settling rate of iron deposits arising from the limestone acid mine drainage mixture will help to decrease creek water contamination. The future project will design and implement a trompe to the mine portal discharge.

Funding: Morris Creek Watershed Inc.

37. Horizontal Axis Wind Turbine: Increasing power by addition of a shroud and diffuser.

Brett Floyd (Raleigh County, West Virginia) and Tavon Johnson (Maryland)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihi

This project has been initiated to evaluate a potential method to increase the power output of a Horizontal Axis Wind Turbine (HAWT) by addition of a shroud and diffuser. The shroud, located at the inlet of the turbine, will be used to increase the inlet velocity to the tip of the turbine blades. The diffuser, located at the rear of the turbine, will be used to decrease the pressure through the nozzle. Through the usage of the COMSOL software, the team was able to confirm the fluid flow calculations through the shroud and diffuser. It was found that by adding a shroud, the wind velocity was increased by 55.4% at the location where the face of the turbine blades will be positioned. Behind the turbine blades, it was found that the pressure was reduced by 9.77% leading to less back pressure effects on the turbine. To further validate the results found in the Computational Fluid Dynamics simulations, experimental analysis will be performed as a part of the future work. The purpose of the experiment will be to verify the overall effect, increase in the power output, which the shroud and diffuser has on the bare small scale turbine that will be used. The testing model that will be used provides power output readings in digital form. This will allow measurements to be recorded accurately and compared to the bare turbine and with the components attached.

Funding: West Virginia University Institute of Technology

38. Factors affecting the Accuracy of Eyewitness Testimony for a Non-Violent Crime

Kelsey Frank (Fayette County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Psychology

Faculty advisor: Cynthia Hall

Eyewitness testimony by witnesses and victims of crimes is heavily relied upon for the identification of perpetrators and determining conviction. Previous research in laboratory settings and real-world data from court trials suggests that eyewitnesses are believed 80% of the time and juries cannot tell the difference between an accurate and an inaccurate eyewitness. Research by Wells et al. (1998) examined 40 trials for individuals who were convicted and later acquitted based on DNA evidence and found that in 90% of the cases, there was false eyewitness identification. Further, a vast amount of research has suggested that eyewitnesses are only accurate between 20% and 42% of the time.

There are many factors involving the situation and the characteristics of the eyewitness that affect accuracy. For example, previous research has found that eyewitnesses are more accurate when identifying suspects of their own race, suspects committing non-violent crimes, more confident eyewitnesses are slightly more accurate than unconfident, and eyewitnesses who were less aroused (frightened, upset, shocked). However, many potential variables have not been examined and a large amount of the literature relies on video footage of staged crimes.

The present study was conducted by staging a live theft in front of an unsuspecting classroom of students and then asking students to provide a description of the perpetrator and crime. A confederate "stole" the handbag of a professor during an introductory psychology course of 46 students. Prior to the theft all seats were numbered and distance from the seatback to the handbag was measured. Variables identified as influencing accuracy in previous research were measured. Other variables such as being the victim of or previously witnessing both violent and non-violent crimes were examined.

Consistent with previous literature, results indicate that individuals reporting less arousal were more accurate and those who were more confident were more accurate. However, contradictory to previous research, individuals who were not of the same race as the "perpetrator" were more accurate than those of the same race. Unexpected results include that those viewing the crime at a greater distance were more accurate than those seated at a close distance. Previous victimization or witness status was unrelated. A follow-up line-up will be conducted before the end of the semester.

39. Numerical analysis of an ocean thermal energy conversion system

Robert Gresham (Kanawha County, West Virginia), Brendon Rankou and Levi Thornton

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihiian

Global warming, increasing regulation and hazardous working conditions associated with fossil fuel consumption for energy purposes continue to push renewable energy technologies to the forefront of the discussion of meeting the world's energy needs. Recently Ocean Thermal Energy Conversion (OTEC) has been one of the focuses of the renewable energy discussion. This project used Aspen Plus modeling software in order to create functioning models of OTEC systems and analyze the data collected to determine the overall power output and efficiency of the systems. The construction of models is of vital importance to the progression of OTEC because these systems require a tremendous amount of start-up and operating costs, and it is extremely important that any scenarios that may occur in the real world application be tested in modeling conditions. OTEC systems utilize the small temperature change required of refrigerants at specified pressures and the naturally occurring temperature gradient of ocean water from the surface waters to bottom waters in order to create a vapor power cycle to produce power. This project utilized the ideal Rankine cycle, in which certain conditions remain constant, in order to predict the efficiency and overall power output of an OTEC system. Once the models were built and fully functioning, a verification of the modeling techniques was performed using numerical calculations and the work of data from literature before any experimental data was acquired. After verification of the two models was performed and the differences in the models and their verifying counterparts were deemed acceptable, data for the heat exchange rates for the condenser and evaporator, and work input and output for the pumps and turbine, respectively, was collected and analyzed in order to determine the overall power output and efficiencies of the two working models. It was found that the efficiency of the numerical verification and literature verification were approximately 4.5% and 2%, respectively. The overall power output of each system was approximately 32 MW and 14 MW. These values fall within the current realm of real OTEC systems and other research, further verifying the students' results. Currently the students are performing data acquisition of how change in the ocean temperature, both at the surface and the bottom of the ocean, effect the system's power output and efficiency.

Funding: West Virginia Institute of Technology

40. WVU Tech Society of Automotive Engineers Baja Competition

Corey Hall (Jackson County, West Virginia), Daniel Richards (Raleigh County, West Virginia), and Joey Stout (Kanawha County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihi

SAE Baja is a collegiate design series where engineering students from all around the world design, build, and compete against each other in a series of competitions. These include a cost and design competition, as well as dynamic events such as a hill climb, acceleration run, suspension and traction course, maneuverability course, and a four hour endurance race. Our team has taken on the task of designing a new vehicle for the WVU Tech SAE team. This includes a new gearbox, rear suspension, and front suspension. The team has also taken on the task of integrating all of the new systems into a redesigned frame. This vehicle will also make use of composite components throughout the vehicle, while incorporating a data acquisition and communications systems, all a first for our university. The new vehicle is being designed and built with performance and reliability as our most important factors. The front suspension incorporates the use of a rack and pinion system as part of steering, the use of air shocks in our suspension setup, and the design of the A-arms to allow adjustments in camber, toe, and caster. The rear suspension makes use of a new 5 link suspension, which optimizes suspension movement in order to best allow the buggy to apply power to the ground in all situations. The new gearbox that is being designed for this vehicle is a single speed double reduction that is significantly smaller compared to previous designs. The major goal of this year's design was to create a lighter vehicle than all the previous years, which includes a 550 lb. and a 400lb vehicle. The race ready weight goal for this year is 325 lbs. All of the design changes that we have made improve on previous systems, while significantly reducing weight, with these changes the WVU Tech SAE teams plans to be very competitive at all three events this season.

Funding: Society of Automotive Engineers at WVU Tech

41. Underwater Turbine Systems in the United States

John Hunter (Monroe County, West Virginia) and Aaron Paynter (Monroe County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihiian

This research focuses on applications and potential implementation of tidal turbine power generation systems. Tidal currents are more predictable and consistent than wind. There is an enormous amount of potential energy waiting to be harnessed from oceans and rivers through the use of underwater turbines that work in a manner similar to wind turbines. Since this is a newer technology more research needs to be conducted and better designs need to be implemented to improve the efficiency and cost worthiness of these systems. This project analyzes potential areas in the United States that could produce power from these turbines. Using data from each of the active sites where NOAA has implemented water current tracking systems, the potential energy was calculated and several suitable locations were identified. Calculations were made to estimate the theoretical power a single turbine could produce based off of the analyzed velocities for that location. Different turbine styles and designs will also be analyzed. The turbines are typically placed on the ocean floor with a very heavy base to keep the unit in place. As the oceans current flows past, the force of the flowing water causes the blades to rotate which in turn powers the generator producing electricity. This electricity is then transferred to on shore substations that connect to the power grid providing electricity for homes and businesses. The equation for turbine power is a function of fluid density, cross sectional area of the space where the turbine blades spin, current velocity, and efficiency. Efficiency is considerably dependent on the design of the turbines. The equation as well as sample calculations are included in the report. After calculating the theoretical power for all locations with available data values for current velocities, the top five were highlighted as good potential locations for underwater turbines. The mouth of the St. Claire River, Cameron Fishing Pier on Lake Charles, Jacksonville Port, North Chesapeake Bay, and the shoreline near Houston/Galveston were identified as good locations.

42. NASA FLIGHT DYNAMICS SPACEFLIGHT CHALLENGE WITH A CIRCUIT BOARD AND TENSILE SPECIMEN DESIGN

Robert Leibel (North Carolina), Scott Browning (Putnam County, West Virginia), and Roger Targosky (Marshall County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihian

This abstract will be going into detail on the progress of the NASA Rock-Sat C design team of the 2015-2016 school year. The challenge included working with 7 other schools, in the state of West Virginia to accomplish an overall goal of getting into the Rock-Sat C competition. The challenge also entails designing a circuit board that must have sensors capable of analyzing certain flight dynamics of a small rocket launch. The basic flight dynamics that are a minimum to have include: acceleration, angular velocity, and magnetic field strength. Groups are allowed to produce more testing into the design challenge as long as it fits into the design constraints. West Virginia University Institute of Technology's design team will be providing a board that entails these items; however, it will be adding a strain gauge sensor on the circuit board that will use a tensile specimen made out of Acrylonitrile Butadiene Styrene Plastic. The strain gauge will help the group analyze pressure/stress during the flight. It will be discussed all of the progress from when the group was formed. This will include the processes used, as well as the research and development of the circuit board design. The report will compare the goals of the team, getting in the rocket canister, and the goals achieved. The goals would include all of the knowledge obtained while working into this design project, conceptual design, circuit board schematics, and the general understanding of the four types of sensors that will be put into the final design of the group's circuit board. The general knowledge includes learning basic Arduino software, developing Solid Works Computer Aided Design fundamentals, and creating the general knowledge of designing a circuit board. The information gained helped progress the group further into the semester, with being able to learn new material, as well as networking/contributing with other schools in West Virginia. Finally, this poster will talk about the upcoming plans for the following semester. This would be creating a final design of the circuit board, and a design that will construct our tensile specimen.

Funding: NASA

43. Renewable-Energy-Powered Smart Windows for Future Smart Homes

Barrett Lynch (Kanawha County, West Virginia) and William Prather (Fayette County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Yadi Eslami

Increasingly, common home components are becoming more intelligent. This trend has been facilitated by the shrinking cost and size of electronic devices, such as microcontrollers, memories, and sensors. Also, the demand for motion-activated lights, programmable thermostats, and automatic window-shading systems has grown substantially in recent years. All of these changes are indicative of a larger movement towards smarter devices and especially smart homes.

This project examines the benefits of a smart window system and frames its existence within the context of the smart home. The device will be an interactive, autonomous system that improves overall home energy efficiency, safety, and security.

The smart window will primarily serve as a semi-passive temperature regulation system, which continuously monitors both the quantity of sunlight and the difference between internal and external temperatures. To take advantage of beneficial air temperature differences and passive solar heating effects, the window will adjust itself by either opening or closing or by adjusting the shades. These adjustments will consider the status of the central air conditioning system so that the operations of each do not interfere with the other.

To improve the home safety and air quality, a smoke detection system will monitor both internal and external smoke concentrations. If smoke is detected, an alarm will sound to notify the present residents, the window will open or close to reduce potential danger, and a text message will be sent to a smart phone to alert those not present. For improved security, motion detection sensors will cause the window to close and lock when an object comes within a certain safe distance. Additionally, to avoid the threat of rain and high winds, the system will include various sensors that cause the window to close when necessary.

To avoid the malfunction and/or disabling of the system by a power outage the final system will be run on solar energy with battery backup, so that it will be fully functional 24/7 regardless of the power grid status.

A prototype smart window system will be designed, built, and tested using off-the-shelf sensors and components. The goal will be to develop a fully functional and secure smart window at minimal cost.

44. An Examination of Narcissism in College Athletes

Mark Magallanes (Arizona)

Institution: West Virginia Institute of Technology

Field: Psychology

Faculty advisor: Cynthia Hall

Previous research has found conflicting evidence relating to whether or not college athletes are more narcissistic than non-athletes. Cross-culturally, some evidence suggests that college athletes are more narcissistic than non-athletes; however, it is unclear due to similarities of narcissism and high self-esteem. Further, few attempts have been made to examine if the tendency for athletes to be more narcissistic is isolated to certain types of sports.

The present study examined the differences in narcissism, using the Narcissism Personality Inventory (NPI-40), between athletes and non-athletes. While high levels of narcissism can be a risk factor for and a symptoms of Narcissistic Personality Disorder (APA, 2015), the NPI-40 is believed to measure “normal” or subclinical narcissism. Further, specific sports were compared to examine the potential differences between types of sports. Types of sports examined include: soccer, swimming, cross country, track and field, wrestling, and cheerleading. The study included 52 undergraduate college students of which a majority (53.8%) were college athletes.

Results indicate that college athletes demonstrate significantly greater narcissism than non-athletes. Follow-up analyses examined narcissism levels in athletes of each sport compared with athletes of all other sports and non-athletes. When compared individually, swimmers, cross country, track and field, wrestlers, and cheerleaders did not demonstrate significantly higher levels of narcissism than all other athletes and non-athletes. Soccer players did demonstrate significantly greater narcissism than all other athletes and non-athletes.

45. Automotive Waste Energy Scavenger

Daniel Noel (Clay County, West Virginia) and Dwight Wilson (Braxton County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Asadollah Davari

Knowing that our earth, though abundant in many resources, will eventually run out of certain key resources, such as fossil fuels the greatest disservice that we can do is to waste. Yet, the most frequently and widely used machine is also one of the most wasteful. Automobiles are typically equipped with a combustion engine that has an efficiency of around 40% this means that 60% of all fuel burnt by your vehicle is wasted. Although the engine itself is very wasteful, simply throwing away a very large amount of the resources used in getting an individual from point A to point B, the worst offender is the source of electrical power on vehicles. Taking the typical engine efficiency if 40%, a belt efficiency of 98%, and an alternator efficiency of 55% the overall efficiency of the conversion of fuel into electricity on vehicles is only 21%. This means that for every kilowatt of power your vehicle produces 4.76 kilowatts are wasted. This project hopes to correct this issue by supplementing or replacing the automotive alternator with devices that will actually harvest the energy that automobiles are wasting and convert it to electricity. This Automotive Waster Energy Scavenger (AWES) system will consist of two main components. The first, will be a magnetic induction generator that functions by turning the energy from bumps in the road into power, using springs, sympathetic vibrations, and Faraday's law of induction. The second, will be a thermoelectric generator that will harness the number one source of energy loss, heat, and convert it into usable electricity using the Seebeck effect. By actually converting wasted energy into usable electricity, the AWES system could increase the fuel efficiency of vehicles by 5% or more reducing the burden on the planet and the driver's wallet.

Funding: West Virginia University

46. The Role of Religiosity in Coping with Stress among College Students

Lesli Taylor (Kanawha County, West Virginia)

Institution: West Virginia Institute of Technology

Field: Psychology

Faculty advisor: Cynthia Hall

The present study investigates further the role that religiosity plays in helping college-aged individuals cope with stress symptoms and behaviors. A majority of individuals in the U.S. consider themselves to be religious. Some research suggests that individuals who are religious experience comfort and greater life satisfaction; however, other research suggests that individuals who are not religious do not benefit from religious comfort. The present study seeks to build on this research by examining the relationship between religious commitment and perceived stress and anxiety.

It is accepted by the academic community that females experience more stress and anxiety symptoms/disorders than males (APA, 2015). In addition, developmental research has found that adolescents in relationships experience more stress and anxiety than those who are single. In an effort to clearly understand the relationship between religious commitment and perceived stress and anxiety, these demographic variables were examined and ultimately included in the final analysis. The findings of the present study were consistent with previous research indicating that females experience more stress than males and individuals in a relationships experience more stress than those that are single. Due to the relationship of these demographic variables with perceived stress, both sex and relationship status were controlled for in the main analyses to determine if religious commitment is associated with less perceived stress, above and beyond the effect of the demographic variables. The results indicate that while sex and relationship status explain the majority of individual differences in perceived stress, religious commitment was found to be related to less perceived stress above and beyond the demographic variables. This research adds to the current body of literature, as well as, demonstrates implications that may be important and beneficial in therapy.

47. Aluminum Alloy Applied in Geothermal Heating Loops

Suman Thapa (Fayette County, West Virginia), Sheng Han, and Caddy Webb

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Horng-Jyh Yang

A geothermal heat pump is a central heating or cooling system that transfers heat or cold to from the ground. No matter where you live, the temperature beneath the earth's surface remains a relatively constant 50 to 60 F, providing a natural and everlasting source of heat. A geothermal heat pump takes advantage of this natural source of heat and transfers it to a home or building, providing warmth and comfort. It uses the earth as a heat source (in the winter) or a heat sink (in the summer). The current geothermal heat pump benefits include 1. Safe 2. Lower Operational Costs 3. Bonus Hot Water 4. Flexibility 5. Green 6. Unmatched Comfort 7. Peacefully Quiet 8. Longer Life Cycle One of the current disadvantage issues is high initial cost which including the land size and installation. The improvement of geothermal heat exchanger can cut down the required land size and reduce the cost for labor to install the proper size of loops. Due to high thermal conductivity in aluminum alloy, the current HDPE or PVC loops can be replaced by a similar design loop but different materials with aluminum alloy. The new product and field test is supported by Halloran Company in Charleston. WVU TECH civil engineering students has involved in this great research to compare the efficiency between traditional PVC or HDPE loop to new aluminum alloy composite loop. The collected data from this summer until this coming winter will be presented in this research achievement.

48. Design and Fabrication of a River Current Energy Conversion System

Levi Thornton

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihian

Increasing concern for the environment and continuing research and development of renewable energies has recently lead to the exploration of zero head hydrokinetic energy conversion system. The majority of the world's hydropower comes in the form of dams and other large head hydrokinetic energy conversion systems, but the invasive nature and large start-up costs of these types of systems has lead the current research in the field to explore zero head hydrokinetic converters. One appealing attribute of zero head hydrokinetic systems is that they convert energy from the pre-existing flow in a body of water, meaning that they do not require the large structures and obtrusions to the natural environment that their high head counterparts do. This project focuses on the application of hydrokinetic energy conversion in rivers and streams, termed River Current Energy Conversion Systems (RCECS), specifically how the engineering design process can be applied to the design of an RCECS from the ground up. Conceptual design is a crucial part of this process because the flow speed is so low relative to other power applications that the maximum efficiencies and power outputs of the system, as well as any variation in the stream conditions and how they can affect the output of the system, must be considered prior to fabrication, testing, and ultimately final product design. For this project the students first had to identify the parameters and conditions that would begin to limit the design of the RCECS. Mounting conditions, local stream velocities, rotor turbine blade designs, identification and application of subcomponents and power transportation all played a major role in the conceptual design of the RCECS. It was found that the rotor blade designs are the greatest factor in determining the power output and efficiency of the system, and a large portion of this project focuses on the optimization methods that are available and the techniques in creating the optimum rotor blade design. Also included in this project are local stream conditions and how, if chosen as a proper testing site, these would affect the design process and resulting RCECS system. Currently the students are creating an optimized rotor design, and once this design has been created and fabrication methods have been reviewed and weighted, the design will continue on down the line until an entire system can be designed based on the engineering design process.

Funding: West Virginia Institute of Technology

49. DESIGN OF A RADIO CONTROLLED AIR CARGO TO COMPETE IN SAE AERO DESIGN 2016

Lyang Suan Wang (Malaysia), Andrew Lytton (Raleigh County County, West Virginia), and Raul Martin Valencia (West Virginia)

Institution: West Virginia Institute of Technology

Field: Engineering

Faculty advisor: Farshid Zabihi

This abstract details the design of a radio-controlled aircraft that spans eight feet wide and will be able to lift twenty (20) pounds payload. The design phase of the aircraft was divided into five major aspects: aerodynamics, structure, stability and control, propulsion, and other important aspects (landing gears, etc.). The aerodynamics focus on the lift and drag components that lead to the selection of the Eppler 423 airfoil that will generate the required lift at low speed (approximately forty-miles per hour) and streamlined fuselage. The structure aspect focuses on the structural integrity of the aircraft in which the team designed the aircraft to be able to sustain a load factor of 3-g and has 1.5 factor of safety. The propulsion focuses on the selection of the motor and propeller that will generate enough thrust to take off within two-hundred feet run way as rule set by the competition organizer. The stability and control aspect focuses on the lateral and longitudinal stability of the airplane where the plane is designed to return to its original stable equilibrium when there is an external force such as gust wind acts on it. Lastly, the landing gears are designed so that it will be able to withstand the landing impact. Once the designed phase has completed, the team will manufacture the wing, fuselage, and the tail in house. Landing gears wheels, propeller, and electronics components such as the brushless motor, battery pack, servos, power limiter, radio control receiver, and electronic speed controller will be purchased from vendors. The proposed design of the aircraft will feature a high-mounted ninety-six inches wide and fourteen inches chord length wing with a square cross-section fuselage to house a four by four by ten inches payload compartment. The landing gears will have a tricycle configuration that is one wheel at the front and two at the back since the back wheels will take the highest impact during landing. The empennage will have a half-H tail configuration to provide better lateral stability. The team so far has finished the computational analysis and design of the wing, tail, propulsion system and the landing gears. The team plans to finish the design of the fuselage and control surfaces before Christmas and build the final product by the end of the year.

50. The Bumble Bees of West Virginia With Special Emphasis on the Kanawha Valley

Hunter Aliff (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Sean Collins

Bumble bees (*Bombus spp.*), the native social pollinators of the Americas, have experienced a precipitous decline over the last 2 decades from a number of sites around the globe (e.g., Oldroyd 2007, Harman 2003). In the closely related honey bee (*Apis mellifera*), a similar decline has been attributed to a combination of symptoms (e.g., *Varroa* mites, *Nosema* (a fungus), viruses, pesticides) collectively referred to as colony collapse disorder (or CCD) (Oldroyd 2007). Unlike honey bees, CCD is not believed to explain declines in *Bombus*; rather, some as yet unknown environmental factor is hypothesized to have dramatically affected the distribution and abundance of several bumble bees species, leading to localized extinctions.

The goal of our research is to assess the local diversity of bumble bees (i.e., the numbers of species and their relative abundances) and to ascertain the presence and relative abundance of two critically endangered bumble bee species (*Bombus affinis* and *B. terricola*), in the Kanawha Valley. Since there have been no studies of the bumble bee fauna of West Virginia to date, the results of this project will serve as the foundation for our understanding of the local diversity of these insects. Additionally, it will also generate valuable data regarding the possible decline of these pollinators.

We've conducted this survey by collecting and identifying individual *Bombus* from a variety of habitats and across a wide range of forage species over the last 2 years. We collected data relative to the following parameters: species identities, relative and absolute abundances, demographic data on total numbers of species present and their local distributions. We also compared local data with those from other areas across the state, by doing so, we have been able to track the rate of decline, the degree to which the decline is isolated to particular regions, and whether all species have declined equally across the state.

Though our data are still relatively preliminary, they do reveal 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 (sensu strictu)*. Indeed, our survey indicated very strong populations of species in the subgenera *Pyrobombus* and *Cullumanobombus*. A particularly interesting finding from our survey was a relatively vibrant population of the otherwise declining species *B. auricomis* (subgenus *Bombias*) at multiple sites, suggesting the potential for parts of West Virginia serving as a refugium for this species.

Funding: National Science Foundation

51. Progress toward the total synthesis of biologically active dihydroresveratrol dimers.

Brandi Bricker (Kanawha, West Virginia)

Institution: West Virginia State University

Field: Chemistry

Faculty advisor: Michael Fultz

Resveratrol (trans-3,5,4'-Trihydroxystilbene) is a phenolic compound that is found in the skin of red grapes and red wine and in berries and peanuts. Pharmacological activities of resveratrol, including anticancer effects and effects on the cardiovascular system have been well documented in cell culture and animal studies and some of the cell signaling pathways modulated by resveratrol elucidated.

Recently enzymatically produced derivatives have been purified after treatment of dihydroresveratrol with crude *Momordica* peroxidase and found to have enhanced antiproliferative effects against PC3 prostate cancer cells (Xie et al. 2009). We describe here our progress towards the total chemical synthesis of some of these derivatives. Upon completion of the synthesis, the derivatives will be tested for antiproliferative and anti-migratory effects with a series of tumor (U87 and A172 glioma cells, CH157MN meningioma cells, Neuro2A neuroblastoma cells, MCF7 breast cancer cells and PANC1, SW480 and SW620 pancreatic cancer cells) and vascular smooth muscle (A7R5).

Funding: NIH

52. Regio- and Quantitative Sulfonation of Polyaromatic Systems for Polymers and Environmental Studies

Morgan Bright (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Chemistry

Faculty advisor: Micheal Fultz

Liquid crystal polymers are popular due to their high strength/weight ratios and other physical properties. The polymers of interest for this project include derivatives of previously synthesized biphenyldicarboxylic acid. In an effort to increase the intermolecular forces between these polymers and strengthen the polymer strength sulfonated analogs are needed to examine the polymer properties. The essential thrust of the second part of the sulfonation products is to generate an organic ligand with a high affinity for the Uranyl ion. The Uranyl ion is highly fluorescent, and we believe very compatible with the single molecule imaging systems that is needed by collaborators at Marshall University. Optical detection of contaminants, particularly using fluorescence, can be considered a highly sensitive method for their analytical quantitation. This project highlights use of these methods for quantitation of a potentially toxic contaminant in soil and water.

Funding: Federal

53. Studies on the ecology of native trees in symbiosis with truffle producing fungi

Stephanie Curry (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Mark Chatfield

Training dogs to find truffles in mid-Atlantic forests. Truffles are underground mushrooms that often emit scents to attract animals that aid in spore dispersal. Several commercial species of truffle have been shown to produce some compounds in common. This suggests that one could train a dog to find numerous truffle species if trained on the common scent(s). In July of 2015 we began imprinting two five year old German Shepherd Dogs on scent emitted from Summer Italian Black Truffles (*Tuber aestivum*). Both dogs are graduates of AKC Canine Good Citizen Classes that established a series of commands allowing them to be controlled in public situations. Working versus playing was clearly established by using a specific vest and leash only during training and these were removed for all other activities. The "Find" command was introduced by having dogs look for people in a "hide-and-seek" fashion. After finding was clearly established the dogs were stepwise trained to return to the handler after a find, indicate they had found someone by sitting in front of the handler (cued with the "Tell Me" command) and this was followed by ("Show Me" command) to prompt the dog to take the handler back to the find. Once finding and working were routinely established the dogs were imprinted on truffle scent using methods that dog handlers use to train cadaver, drug and bomb dogs. The two dogs' behavior is being further shaped such that they are routinely identifying containers with truffles and sitting to indicate that they have found the scent versus a blank or control container. The next phase of the training is to introduce progressively more difficult search problems until the dogs are routinely finding truffles in forest soil situations with few errors. The last training phase will be to work dogs in forest or tree plantations that contain truffles and demonstrate that they can find the truffles reliably and consistently. The ecological studies will commence when the trained dogs are used to locate wild truffles thus establishing a more efficient means to study the mycology and ecology of wild truffles species in West Virginia and nearby states. Information gathered on the identity of the host tree species, resident soil type, timing of fruiting, associated weather and climate will facilitate commercialization of these valuable fungi. Truffles, training aids, videos of the process and if possible the dogs will be on display to explain this process.

Funding: West Virginia State University

54. Sequencing of ribosomal and mitochondrial DNA for species of *Paraorygmatobothrium*

Victoria Daniel (Putnam County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Tim Ruhnke

Paraorygmatobothrium Ruhnke, 1994 is a genus of tapeworms found primarily in the spiral intestines of carcharhiniform fishes such as hammerhead sharks and requiem sharks. Erected by Ruhnke (1994) and housing only three species, *Paraorygmatobothrium* has now grown to include twenty-two and that is likely less than half of the actual number of species discovered, but not yet formally described (see Jensen and Bullard, 2010). The purpose of this research is to add select samples of *Paraorygmatobothrium* species from the Gulf of Mexico to the 28S ribosomal large subunit (LSU) DNA database of Jensen and Bullard (2010) as well as additional non-Gulf species from South Carolina for verification. The creation of a dataset for samples of which both mitochondrial CO-1 DNA and ribosomal LSU DNA sequences are available has been another goal of this research. The protocols used were from Haslach (2014) and Cox (2013). The expansion of the collection of hologenophore (voucher specimen) accessions of the genus is also critical for the current study as it allows for the study of the variability of scolex and proglottid morphology. The morphological data can then be used to help determine the boundaries between new and existing species of the genus morphologically. The ultimate goal of this research is an honors thesis.

55. Diversity analysis of fruit colors in *Capsicum chinense*

Josh Davidson (Lincoln County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Umesh Reddy

Fruit color at the ripening stage is a defining attribute in peppers and is a direct result of carotenoid accumulation. These molecules such as capsanthin-capsorubin, are responsible for the red, orange and yellow pigments which act as photo-protective agents. Current study is to understand the variation in the contribution of each color components (L^* , a^* and b^*), Hue and Chroma which provide insight into pepper color variation. Pigmentation in tomato is controlled by many genes. Two hundred accessions of *Capsicum chinense* were included for this study. Ripen fruits were scanned and analyzed in tomato analyzer software V 3.0 conjunction with Munsell color system for color attributes. Results pertaining to color diversity will be presented.

56. New Maps and Age Estimates for Landslides, Valles Marineris, Mars.

Megan Guetzloff (Cabell County, West Virginia),

Institution: West Virginia State University

Field: Astronomy

Faculty advisor: Andrew Schedl

Valles Marineris is a 5,000 km long canyon running along the Martian equator. It contains many large, $>100 \text{ km}^2$ in area, landslides. Our ultimate goal is to determine the cause of these landslides. Previous work (Akers et al. 2012; Duffy and Schedl, 2015) suggests that marsquakes rather than meteorite impacts produced these landslides. This result would imply that Mars is geologically active and more likely to support life. This conclusion is dependent on whether Quantin et al.' (2004) crater isochron ages for the landslides are accurate. A recent study suggests that areas must be at least 1000 km^2 to give reliable ages. Many of the areas dated in Quantin et al. 2004 $<100 \text{ km}^2$, so the landslide ages are suspect.

The objectives of this study are to re-date and remap the landslides. The landslides were identified using the image IDs in Quantin et al. (2004). From the image ID's latitudes and longitudes of the satellite imagery were identified to map out the landslides. From imagery landslide maps were constructed and landslide areas were determined. With higher quality imagery available today many of the previously identified individual landslides are found to consist of multiple landslides. Below, **Table 1** shows Quantin et al's areas and our areas for the same landslides.

Table 1: Areas For (This Study) VS Areas Quantin et al (2004)

Landslide Number	13	33	26	38	29	46	27	60	25	34	42	15
Quantin et al 2004 (km^2)	3735	800	585	1927	2099	2082	1464	2334	1003	702	4435	1130
This study (km^2)	2256	2125	2018	1901	1863	1663	1594	1531	1278	1214	1054	1052

Dates of geologic features on Mars are based on areal densities of craters of different diameters. Diameters of craters within landslides are measured from images using the Crater Layer of the GIS program Jmars. Landslides area and crater diameters within a particular landslide are analyzed using the program Craterstats2. Craterstats2 places binned crater diameters and calculate areal crater densities on an isochron diagram and a rough age of the landslide is given. Using these results and the crater production functions of Ivanov (2001), the data are regressed to give an age with error bars of the particular landslide. For landslide 13, I obtained an age of 300-500 Ma, little different from Quantin et al's age if 300 Ma.

Funding: WV EPSCOR #1003907 and NASA scholarship

57. The State of Diversity on WVSU's Campus through the Eyes of Its Students

Laura Hedrick (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Communications/Journalism

Faculty advisor: Ali Ziyati

Diversity in a university describes the presence of people on a campus who differ in terms of race, culture, ethnicity, religion, socioeconomic status, sexual orientation and ability. It also means the presence of people with diverse opinions, political views, and academic passions. However, a true, comprehensive definition of diversity should also include ways in which a diverse population engages with and explores its differences (Weinland, 2012). "WVSU addresses diversity at prominent administrative levels that include the president and vice presidents and throughout all facets of the campus community. Article II of the Affirmative Action Policy states that WVSU is an Equal Opportunity/Affirmative Action institution that does not discriminate against any person because of race, religion, color, national origin, ancestry, sex, age, marital status, or disability. In 1983, the University amended this policy to include activities related to the management of its educational, employment, financial business and other affairs." (WVSU Purpose Statement) Having a diverse population of students is important to the growth and wellbeing of a university as well, because it allows students to have a better understanding and appreciation of different cultural differences and similarities among one another. The purpose of this study is to discover students' attitudes toward cultural outreach on campus by using quantitative and qualitative methods in the forms of questionnaires, personal interviews and content analysis.

Funding: McNair Scholars Program

58. Effect of Horizontal Directional Drilling Mud Application on Soil Salinity

John Lucas

Institution: West Virginia State University

Field: Environmental Studies

Faculty advisor: Amir Hass

The increase in oil and gas activity in the region leads to corresponding expansion in pipeline infrastructure. Horizontal directional drilling (HDD) is a method used to install pipeline underground in order to keep existing infrastructure or ecologically sensitive areas undisturbed (highways, wetlands, rivers, etc.). Water based sodium-bentonite (HDD mud) used in the process and the resulting spent mud is deemed suitable for land application by US EPA. Yet, elevated levels of sodium and total dissolved solids (TDS) can be detrimental to soil physical properties and crop yield. In this study, the effect of HDD mud on properties of eight different soil types was determined. HDD-mud treated soils were extracted and TDS and elemental composition determined. TDS Increase was soil and mud application rate dependent. Inasmuch as TDS levels increased up to 2.8 times that of background levels, these values were below threshold values that result in yield reduction of sensitive plants (1.0 mS cm^{-1}). Furthermore, sodium content in the mud decreased by two orders of magnitude during HDD operation (from 1.6% down to 0.04%). These preliminary results are part of a larger research project directed at development of recommendation for the use of the spent HDD mud as soil amendment in the tri-state region – West Virginia, Pennsylvania and Ohio.

59. Trialing SucraShield on the Biocontrol Generalist Predator, Green Lacewings, *Chrysoperia rufilabris*

Seth McCormick (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Barbara Liedl

Organophosphate pesticides are among the most commonly used due to their efficacy in eliminating insect pests from production. They kill indiscriminately and negatively affect many non-target organisms. Acute exposure in humans can cause convulsions, paralysis of the diaphragm, and even death. Growers have embraced the use of integrated pest management (IPM) to control pests when available, but often must revert to using pesticides. Thus, there is an interest in developing safer insecticides based on the evolution of pesticide-resistant insects and increased health and environmental concerns. Acylsugars are exuded from type IV trichomes of the wild tomato species, *S. pennellii* and mediate the resistance to a number of insect pests. They also have a great potential, as they are non-toxic and give broad-spectrum resistance to two major pests: whiteflies and aphids. SucraShield is safer for humans than organophosphates and can control aphids, whiteflies, and other soft-bodied insects. Studies were conducted on target organisms but its effects on beneficial insects have never been published. The lacewing (*Chrysoperia rufilabris*) is a beneficial soft-bodied insect that feeds on insect pests for a large portion of its life. Biological controls are insects that feed on pests and are introduced in an effort to reduce the need for harmful pesticides such as organophosphates. The goal of this project was to assess if SucraShield negatively affects lacewings and to quantify those effects as a reference point for an ongoing project concentrated on improving the efficiency of pest management for tomatoes in protected culture. A lacewing colony was established to provide larvae and adults for testing. Water was used as the negative control in the trials with the insecticide Malathion as the positive control. The bioassay used a worst-case cumulative exposure scenario, where test subjects were exposed to one of the three treatments through contact, residual and ingestion exposure. Malathion and SucraShield treatments were applied at the maximum manufacturers' recommended rate with water as the carrier. Larvae and adults treated with Malathion died within the first day. Treating larvae with water or SucraShield showed no statistical differences in the days to pupation or mortality rates. Adults treated with SucraShield were more likely to be stuck to the container than those treated with water, however both of these treatments produced larvae from the eggs that were laid. SucraShield does not have a deleterious effect on the biological control, green lacewings.

Funding: NSF, NASA

60. Progress toward the synthesis of Sumalarin A

Emma Nellhaus (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Chemistry

Faculty advisor: Micheal Fultz

The engineering of anti-cancer therapies has taken on an interdisciplinary role, even within the chemistry arena. Photodynamic metal-based anti-cancer agents take advantage of the ability to tune transition metal complexes (via alteration of coordination number, coordination environment, functionalizing of coordinated ligands, intra- vs. intermolecular electron transfer, etc.) to create a highly efficient therapy with low side-effects. This work details the synthesis of a RuII/PdII polypyridil complex that has been engineered to take advantage of the photophysical characteristics of RuII(bpy)₃²⁺ analogues in conjunction with a platinum group transition metals well documented efficacy as an anti-cancer agent.

Funding: NIH

61. Students' Perspective on Advising and Registration

Casey Owens (Lincoln County, West Virginia)

Institution: West Virginia State University

Field: Sociology

Faculty advisor: Kerri Steele

The purpose of this research is to improve the main areas of advising and registration identified by West Virginia State University students in their response to a survey developed by the researcher. The data can be used to make changes to the current methods of advising and registration which will improve retention rates and the student registration process. In order to ensure that students take advantage of early registration an evaluation of the advising practices at West Virginia State University (WVSU) is necessary. The study considers research questions that are designed to determine what contributes to students advising late and what measures can be taken to encourage early advising. Furthermore, this study will consist of a correlational research design to reveal the connections between multiple variables such as demographics, time of advisement, and future incentives to register early. This study hopes to identify correlates between student demographics and advising patterns. The data gathered from student responses will be analyzed using SPSS. Overall, many factors play a role in the students' time of registration which can affect their academic outcomes. It is important to understand what contributes to students registering on time in order to encourage others to do so. Correspondingly, advisors and other individuals who play a major role in the students' academic lives should be consulted more regularly to further investigate the impact of the advising and registration process on student success.

Funding: McNair Scholars Foundation

62. Biochar and Soil Carbon Sequestration

Claire Shanholtzer (Putnam County, West Virginia)

Institution: West Virginia State University

Field: Environmental Studies

Faculty advisor: Claire Shanholtzer

Greenhouse gas emission from the use of fossil fuels has been an ongoing issue related to climate change and global warming. Emerging pyrolysis technologies have allowed the conversion of plant biomass into bio-crude, a potential substitute for petroleum. During the process, as woody or herbaceous biomass is converted into bio-crude, a co-product called biochar is formed. Biochar is a charcoal-like recalcitrant carbon-rich solid material that can be used as soil amendment. Adding this recalcitrant carbon-rich material to soil is likely to result in limited decomposition, leading to soil carbon sequestration – accumulation of carbon in soil and a slow net release of CO₂. As such, the use of biochar as a soil amendment could possibly reduce the amount of carbon dioxide already in the atmosphere by converting it to a more stable form in the soil while producing oil, overall releasing less carbon than is being initially captured in plant biomass by photosynthesis. In this project, we will conduct multiple incubation studies to monitor the release of CO₂ from soil mixed with different biochars that have been produced from different feedstock's and at different processing conditions. Effect of the different biochars on CO₂ release and subsequent net soil carbon sequestration will be determined.

Funding: NASA

63. Anti-Cancer Activity of Organometallic Compounds

Amanda Smith (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Biology

Faculty advisor: Gerald Hankins

Cisplatin, a platinum compound, is a compound that is used in over half of chemotherapy cancer treatment regimens.¹ Although this compound is widely used and has been successful there are many tumors that have resistance to the compound. Along with tumor resistance, cisplatin also has a high toxicity. Therefore, new compounds are required with lower toxicity and targeting specificity. The objective of this research is to evaluate organometallic compounds for anti-cancer activity. Specifically we evaluated the effects on tumor cells that were grown in flasks. Three different tumor cells were used: meningioma, glioblastomas, and pancreatic cancer cells. A meningioma is a tumor that arises from the meninges, the membranes that surround your brain and spinal cord. Meningiomas are usually benign (non cancerous) in nature; however small percentages are malignant (cancerous). Meningiomas account for over one third of all primary tumors of the central nervous system.² Individuals diagnosed with pancreatic tumors have a only a 6% five year survival rate post-diagnosis.³ Glioblastomas are found in the brain or spinal cord. These tumors are usually highly malignant. There is less than a 10% chance of survival for five years after diagnosis. Glioblastomas are the most common and deadly of brain tumors.⁴ All three cell lines were treated with four organometallic compounds that were obtained from a collaborator, Joseph Merola, at Virginia Tech. DMSO, a solvent that dissolves polar and nonpolar compounds, was used as a vehicle control as this compound was what was used to dissolve the compounds into solution. A WST8 Assay, an assay that determines the concentration of living cells, was then used to determine the relative numbers of viable cells after treatment with the compounds to that of cells treated with the vehicle control, DMSO. Treatment of the meningiomas cells resulted in a dose-dependent reduction in the treated cells. For the glioblastoma and pancreatic cancer cells, the results were variable and there is more work to be done to determine whether or not treatment results in significant reduction in viable cells. This research has a significant importance to science and society as the research team tries to determine a less toxic and more efficient method of using metallic compounds in chemotherapy.

Funding: DOW

64. Synthesis of a RuII/PdII Polypyridil Bimetallic Complex Anticancer Agent

Justin Spradling (Kanawha County, West Virginia)

Institution: West Virginia State University

Field: Chemistry

Faculty advisor: Sharon Molnar

The engineering of anti-cancer therapies has taken on an interdisciplinary role, even within the chemistry arena. Photodynamic metal-based anti-cancer agents take advantage of the ability to tune transition metal complexes (via alteration of coordination number, coordination environment, functionalizing of coordinated ligands, intra- vs. intermolecular electron transfer, etc.) to create a highly efficient therapy with low side-effects. This work details the synthesis of a RuII/PdII polypyridil complex that has been engineered to take advantage of the photophysical characteristics of RuII(bpy)₃²⁺ analogues in conjunction with a platinum group transition metals well documented efficacy as an anti-cancer agent.

65. West Virginia as a Real and Reliable Tourism Destination

Brianna Austin (Greenbrier County, West Virginia)

Institution: West Virginia University

Field: Business

Faculty advisor: Ajay Aluri

According to the U.S. Travel Association, more than 75% of domestic trips are related to leisure travel (U.S. Travel Association, 2015). In West Virginia, tourism is the second largest employer and fifth largest industry in terms of revenue. (GoToWV.org). A recent study conducted by Bureau of Business and Economic Research, shows that the WV state's image as a regional tourism destination is vital for the state as it was predicted a 0.7 increase per year in the job market (BBER, 2015). With so many issues of unrest, terrorism threats, and safety, are more travelers looking for reliable tourism destinations, such as West Virginia? If yes, how we can market and advertise tourism product so that travelers view WV as a real and also reliable destination? For this study, we examined the Baltimore market and the impact of recent unrest on the tourism industry by conducting research from August 2015 – November 2015. The purpose of the research was to determine if the unrest would affect the hospitality industry either now or in the future. Market tracts, specific locations of the unrest, and data from previous years were taken into consideration. There was a 4.1% decrease in occupancy and a 3.1% decrease in RevPAR in May of 2015 when compared to that of 2014 (STR Data, 2015). Ultimately it was determined that there was not a significant impact, but the potential for loss of group business in the future is still highly possible. We also predict that most leisure travelers are looking for reliable destination instead of going to Baltimore, Washington, D.C, New York City, etc. This can be directly related to the hospitality industry in West Virginia. When tragedy occurs in bigger cities such as the aforementioned, places like West Virginia may have many opportunities to do very well. The recent unrest had a short-term impact on the Baltimore market. However, the brand image of Baltimore as a reliable destination is still a question for the next few years. With worldwide events of terrorism and threats in the U.S., leisure travelers will be looking for reliable destinations like West Virginia. Recently, WV Tourism Commission has launched a successful tourism campaign as a "Real" destination. Furthermore, we would like to recommend West Virginia tourism commission to market and advertise as a reliable destination.

Funding: West Virginia University

66. Speech-Language Pathology Graduate Exit Requirements: National Trends

Jared Ballard (Lewis County County, West Virginia), Samantha King (Maryland), and Leah Casto (Virginia)

Institution: West Virginia University

Field: Education

Faculty advisor: Mary Ellen Tekieli-Koay

Summative (exit) requirements obtained from 260 graduate programs in communication sciences and disorders (CSD) were determined to compare requirements for successful completion. Frequency counts were used for data analysis. The information varied widely among the programs. Results and implications relative to M.S. degree programs in other fields will be discussed. Graduate programs publish or post information regarding summative requirements (ASHA, 2014). However, the information included on CSD program websites varies widely among the programs with some information incomplete or not reported at all. Furthermore, variability in the layout of each program website results in a unique content navigation for each. These factors make it very cumbersome and time consuming for prospective graduate students to discover summative information about particular graduate programs that is of interest to them and thus may influence their choice of graduate programs to which they will apply and, if admitted, attend. Graduate school success is usually measured by graduate GPA and PRAXIS scores (Forrest & Naremore, 1998; Garrity et al., 2008; Halberstam & Redstone, 2005). This study is concerned with determining the various summative (exit) requirements of CSD graduate programs that students need to complete successfully to graduate with a masters degree in speech-language pathology.

Main findings: ¥ The summative requirements vary across the CSD master's degree programs. ¥ The comprehensive exam continues to be the prevalent exit requirement (required by 25 per cent of the programs). (Figure 1) ¥ Schools that require a comprehensive examination sometimes offer PRAXIS score replacement (if students attain a certain score on the PRAXIS, they will not be required to take a comprehensive examination). ¥ Several schools still use the PRAXIS as the sole summative requirement; this trend was widespread 10 years ago. ¥ Approximately 6 per cent of the graduate programs report using portfolios as formative and/or summative assessments. If the portfolio is used as a summative assessment, it is almost always paired with a comprehensive examination, a final paper, PRAXIS examination, and/or thesis. (Figure 2) ¥ Approximately 6 per cent of the schools report using the thesis as the summative requirement. (Figure 3)

67. Adjustment Factors for Selection for Loin Eye Area or Depth in Replacement Ewe Lambs

Sarah Battista (Ohio)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Keith Inskeep

Ultrasonography is a low cost, practical option for beef and sheep meat producers to estimate the carcass composition of the live animal. Specifically, it provides objective measurements of loin eye and back fat, thus estimates the carcass size useful for predicting the market value of growing animals. The objectives of this study were twofold: (1) to evaluate if the loin eye area, loin depth and rib fat (dependent variables) vary with age, weight, and breed type or season of birth (independent variables) of ewe lambs in a farm flock and (2) to predict future measurements for a live animal with adjustment for age, weight or a breed type, useful for comparisons in breeding selection program. Data have been collected during a 4-year period on replacement ewes of Texel, Dorset, and crossbred types. Two ultrasound images of the loin eye area and loin depth between the 11th and 12th rib were recorded using an ultrasound instrument Aloka 500, with a 3.5 linear transducer probe. The regression equations developed from combined data for years 2012 (n = 104) and 2013 (n = 75) will be validated on the data from 2014 (n = 99) and 2015 (n = 139). Least squares mean loin eye area (square inches) was 1.78 in 2012 and 1.80 in 2013. Weight alone, including linear and quadratic effects, accounted for 44% of the variation in loin eye area; year, age and breed were not significant. The effect of weight on loin eye area was explained best by the polynomial equation: $\text{Loin eye area} = 0.216 + 0.018 * \text{Weight in lb} - 0.0002 * (\text{Weight in lb} - 87.844)^2$. Mean loin depth was 0.94 inches in each year of 2012 and 2013, and breed and weight accounted for 32% of the variation; year and age were not significant predictors. The polynomial equation that best described the loin depth was: $\text{Loin depth} = 0.488 + 0.005 * \text{Weight in lb} - 6.011e-5 * (\text{Weight in lb} - 87.844)^2$. Based on the results, ultrasonographic measures of rib eye and loin depth in replacement ewes can be adjusted for weight of the live ewes and do not depend of the age and breed of the ewes. Further analyses will include the rib fat (dependent variable), pregnancy status (independent variable), and an additional breed (Suffolk) as well as validation of the developed equations on the recently acquired data.

Funding: NCERA 214 and Wherry's Farm

68. Silver Based Direct Written Electrodes on Pliant Substrates

Jared Beard (Monongalia County, West Virginia) and Anna Cokeley (Ritchie County, West Virginia)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Konstantinos Sierros

Recently, there has been a shift towards the development of flexible electrodes, as an alternative to fluorine doped tin oxide (FTO) and indium doped tin oxide (ITO) due to their brittleness. Growing interest in pliable technologies, stems from the need for a broader range of applications, where the electrodes may be required to bend or conform to irregularly shaped components. Flexible electrodes would allow electronic devices such as solar cells, being made with lighter, compliant materials, to be more readily implemented on diverse structures. Direct writing offers a means of precise, low waste production in next generation manufacturing for these components, which in turn will decrease the difficulty and expense of electronic device production, being suitable for roll-to-roll processing. As such, this research focuses on the direct writing of a particle-based Ag ink under ambient conditions and mild annealing temperatures. In producing the ink, Ag yield was on the order of 60%. Using a nozzle based robotic deposition, patterns were printed onto polyethylene naphthalate (PEN). The patterns were characterized for optical transmittance and electrical performance, in relation to the annealing conditions and cyclic mechanical stress. Microstructural development was also studied. We show that Ag patterns as produced by direct writing, offer a promising avenue for reliable electrodes in flexible electronic devices.

Funding: NASA West Virginia Space Grant Consortium

69. Computational Modeling of the Oxidative Coupling of Methane in a Reactive Membrane System

Brent Bishop (Ohio County, West Virginia)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Fernando Lima

The oxidative coupling of methane (OCM) is a process that converts abundant natural gas to high-value ethylene product. Ethylene is the most annually produced organic product in the world. A mathematical model of an OCM reaction system that takes place in a reactive membrane is developed by combining separate models for the reaction kinetics and the membrane permeation components. The stand-alone reaction model is validated with experimental conditions from the literature with a level of accuracy of $\pm 15\%$. The addition of a highly-selective oxygen membrane is expected to reduce the undesired oxidation reactions that consume the methane reactant, ethane intermediate, and desired ethylene product by controlling the flow of oxygen to the reaction, leading to a higher selectivity of ethylene. This developed model will be used to study the OCM process conditions to maximize the economic benefits of potential process scale up.

Funding: SURE program

70. An assay to evaluate the effectiveness of contact lens solutions for treating Acanthamoeba cysts

Lloyd Border (Jackson County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Wendy Trzyna

Acanthamoeba spp. are commonly found throughout the environment, in soil and many water sources. The non-active cyst form of the amoeba are highly resistant to killing and have been isolated from public tap water, including in Huntington, WV. There are hundreds of different strains of *Acanthamoeba*, and some cause a serious eye infection, amoebic keratitis. Keratitis is an infection of the cornea that can result in permanent visual impairment and progress to blindness. Contact lens wearers have an increased risk of infection, which may be exacerbated by improper handling or disinfecting of lenses or storage cases. Some studies have isolated *Acanthamoeba* cysts from water-washed contact lens cases. It is imperative to ensure that common sanitation methods and solutions used to treat lenses are effective in eradicating the amoebae and thus preventing keratitis. A wide range of studies have tested the effects of contact solutions on amoebal growth but on a qualitative scale. Most studies report little effectiveness by saline solutions of inhibiting growth, and few have rigorously quantified the resultant data. Many of the studies to date report their findings as “high growth”, “no growth”, or “some growth”. The use of these terms vary from study to study and thereby makes it difficult to make direct comparisons. Therefore, there remains a need for a more standardized means of assessing the effectiveness of contact lens solutions against *Acanthamoeba* trophozoites and cysts. This study approaches the issue with the use of a novel “amoeba migration assay,” developed in this laboratory. In this assay, a precise number of *Acanthamoeba* cysts are placed on linear, standardized streaks of *E. coli*, which serves as a food source. The cysts are then able to excyst and begin to grow and divide. As the cells proliferate, the bacteria along the streak are consumed, and the space covered by the “advancing front” of proliferating amoebae is measured daily. In addition to measuring migration, amoebae are also harvested from plates and counted (both trophs and cysts). This novel method provides a more quantitative approach and allows direct comparisons of the relative effectiveness of various contact lens solutions. This study assesses the effectiveness of several leading brands of contact lens solution for their effectiveness in killing/inactivating *Acanthamoeba* cysts. For comparison, the effects of EPA allowable chlorine concentrations (4 mg/L) and higher were carried out to demonstrate the efficacy of treatment and the reproducibility of the assay.

71. Identifying Effectiveness of Twitter at West Virginia University when Targeting a Large Audience

Dakota Bowyer (Raleigh County, West Virginia)

Institution: West Virginia University

Field: Communications/Journalism

Faculty advisor: Melissa Olfert

Introduction: Social media is an important tool in today's society. Utilizing this method within research allows researchers to reach targeted audiences more effectively. As a part of a larger project, Get Fruved, social media is largely used to increase healthy lifestyles among college-aged students. The objective of this study was to identify the effectiveness of Twitter as a social media outlet when trying to reach college students. **Methods:** Twitter, the microblogging and social networking platform, was used to reach a target audience of first year college students. This target audience was reached by using specific hashtags such as '#WVU19', which specifically targets the West Virginia University freshman class of 2019. Tweets were developed and inserted into a spreadsheet by a multistate team of student researchers from the intervention states within Fruved. These tweets were then uploaded to an online platform that would automatically send them out at optimal times. This platform, called Hootsuite, was utilized to create uniformity in the intervention while also allowing researchers to reach the largest audience. Data was then collected from impressions (times people saw a Tweet on Twitter), total engagements (times people interacted with a Tweet on Twitter), and followers (number of users subscribed to this Twitter page) on the West Virginia University Get Fruved Twitter page. **Results:** 157 users subscribed to this page over the course of thirteen months. In September, Tweets had an average of 326.6 impressions and 14.6 engagements. In October, Tweets had an average of 410.9 impressions and 18.9 engagements. During these months, a user was exposed to Get Fruved content 30,142 times. Through a 25.8% increase in impressions and a 29.5% increase in engagements from month to month, this is identified to be a substantially effective means of reaching a larger audience. **Conclusion:** Various forms of social media are used daily by a large amount of people. In relation to this research, Twitter is an effective tool being used to impact a large target audience at West Virginia University.

Funding: USDA

72. A Survey to Assess Undergraduate College Students' Attitudes on E-Cigarette Usage

Alexandra Buckner (Virginia) and Alexa Greenlief (Braxton County, West Virginia)

Institution: West Virginia University

Field: Psychology

Faculty advisor: Kristafer Adkins

Background: The recent introduction of the alternative nicotine delivery device, electronic cigarettes (e-cigarettes), has caused discussions about their use in public buildings, marketability, consumer's age restrictions, and whether they are safer than traditional cigarettes. **Methods:** Since West Virginia leads the nation in the use of smoke and smokeless tobacco products, researchers chose to conduct a sixteen question electronic survey of the 23,982 undergraduate students at West Virginia University (WVU) to determine their opinions about the use of e-cigarettes. They were asked to rate each question on a scale of: strongly disagree, disagree, agree, and strongly agree. **Results:** Of the West Virginia University undergraduate college students 1,563 completed the survey with a response rate of 6.5%. Out of the 695 male responders 68.5% identified as being non-tobacco users, 30.9% claimed to use tobacco products while 18.1% were e-cigarette users. As for the 859 female respondents, 87.5% stated they were non-tobacco users, 12.2% claimed to use tobacco products, and 8.4% were e-cigarette users. A total of 67.8% agree or strongly agree that people are more likely to use e-cigarettes in place of cigarettes; 90.9% of participants agreeing or strongly agreeing that e-cigarette purchases should be restricted by the consumer's age; 66.1% agreed or strongly agreed that locations of e-cigarette usage should be restricted the same as cigarette usage; 74.9% of the participants disagreed or strongly disagreed that e-cigarettes should be permitted in public buildings; 88.2% agreed or strongly agreed that marketing of the e-cigarette flavorings increase the likelihood of people using e-cigarettes; and 78.4% agreed or strongly agreed that e-cigarettes can assist in cessation of the use of other tobacco products. **Conclusion:** Participants believe e-cigarettes are more likely to be used compared to cigarettes. They also recognize that purchasing e-cigarettes should be restricted by the consumer's age and that their location of use should be restricted the same as cigarettes. Participants believe e-cigarette use should not be allowed in public buildings and that marketing of flavorings increase the likelihood of e-cigarettes being used. Lastly, participants recognize e-cigarettes as a tobacco cessation aid.

73. Implementing an Enterprise-Level Geospatial Application for Improving Transportation Planning

Sarah Campbell (Indiana) and Charles Peck (Harrison County, West Virginia)

Institution: West Virginia University

Field: Geography

Faculty advisor: Trevor Harris

The West Virginia Department of Highways houses thousands of vital engineering plans in documents that are rapidly deteriorating and extremely difficult to access in an efficient manner. Given the demand for these plans and the high content volume, the task of information retrieval for planning and contractual work has created a significant accessibility gap between designers, contractors, and field personnel and the engineering plans. The development and implementation of a digital geospatial application will considerably reduce this accessibility gap and provide effective identification and transmission of critical engineering information to personnel. The development process to create a geospatial repository involved transforming hard copy highway plans into digital versions by scanning, enhancing image quality, consolidating, and geo-referencing these images with their respective geographic location. It is the geographic location that the engineering plan refers to you that drives the search criteria and using this within GIS creates a very effective search and retrieval environment. The digital search index and repository proves a secure, efficient, and accessible database for storing and maintaining DOT plan archives. Over 70,000 plans were scanned and processed and great care was exercised to make the digital data consistent and readable. Adobe products and especially their Optical Character Recognition tools were used to enable text searches of the plans to be performed. This geospatial application comprises an online database of GIS Mosaics created from processed DOH plans. The benefits of such a system are manifold: 1. The system provides a long term solution to decaying engineering hard copy plans. 2. Conversion to digital format negates the need for massive climate controlled storage warehouses. 3. The knowledge needed to access relevant stored plans no longer depends on specific individuals. 4. Access to this vast repository of engineering plans is now available to all DOH personnel and delegated authorities. 5. Plan search and retrieval is almost instantaneous resulting in immediate efficiency improvements. 6. Multi-party project connectivity and communication between designers, contractors, and field personnel is greatly improved. 7. Ultimately the system results in improved and timely decision making, lessened bureaucracy, savings in document storage, and more effective and cost efficient government.

Funding: West Virginia Department of Highways

74. Chronic acid deposition reduces the colonization of roots by beneficial fungi

Brittany Carver (Monongalia County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Edward Brzostek

Chronic acid deposition reduces the colonization of roots by beneficial fungi
Brittany Carver, Undergraduate, Biology Department, West Virginia University, Morgantown, WV 26505. Dr. Edward Brzostek, Assistant Professor, Biology Department, West Virginia University, Morgantown, WV 26505. Historically, West Virginia forests have received some of the highest inputs of nitrogen and sulfur from acid rain. The Clean Air Act has greatly reduced these inputs but there remain legacy effects on forest health. These effects are important because forests in West Virginia are critical sinks of carbon dioxide and help maintain water quality in the region. Generally, trees produce more wood when they are fertilized by the nitrogen in acid rain. However, there are also important responses that happen in the soil beneath our feet. Trees in WV forests invest carbon (i.e., carbohydrates) in maintaining beneficial fungi called mycorrhizae that help them attain nutrients. When these mycorrhizae die they directly feed into long-term soil carbon storage. We hypothesized that when trees receive additional N through acid rain they would invest less carbon in mycorrhizae and other pathways to access nutrients. We sampled soils from a long-term experiment at the Fernow Experimental Forest in Tucker County, WV. We compared belowground responses between a watershed that receives additional acid rain inputs by helicopter and one that is a control. We found that acid rain reduced mycorrhizal root colonization and total fine root biomass. In addition, the shape of roots was altered, reducing the amount of branching and thickness. These results suggest that acid rain reduced root and mycorrhizae foraging for nutrients. This reduction could have important implications for carbon storage in soils because roots and mycorrhizae are the dominant substrates for new stable soil carbon formation. Given that these potential soil carbon losses could counterbalance enhanced wood production, these results have important implications on whether WV forests will continue to slow climate change.

Funding: West Virginia University

75. Direct Writing of TiO₂ Photoanodes for Perovskite/Dye Sensitized Solar Cells

Domenic Cipollone (Kanawha County, West Virginia), Lynnora Grant,, and Maria Torres Arango

Institution: West Virginia University

Field: Engineering

Faculty advisor: Kostas Sierros

Perovskite/dye sensitized solar cells are of great interest as promising alternative solar cells, due to their lower fabrication cost since no high purity materials are required, as opposed to the conventional highly pure, doped Si crystalline cells. Currently, the Flexible Electronics for Sustainable Technologies (FEST) at West Virginia University is working towards developing efficient and industrially scalable perovskite/dye sensitized solar cells. The photoanode of the cell, commonly made of TiO₂, is a pivotal component of the system, being the electron transport material and template for the active perovskite/dye molecules. This research focuses on the development of a porous, yet continuous TiO₂ layer through direct writing of TiO₂ solution based inks onto glass and polymer substrates. The methods to characterize the inks include viscosity and contact angle measurements, and the study of the printing parameters such as speed, pressure, and distance to substrate. The proposed additive patterning method is found to be highly dependent on the ink's viscosity. The viscosity is tailored by varying the ratios of the crystalline TiO₂ to Ti-organic-precursor. Additionally, the printing can be further aided by the inclusion of various polymers into the formulation. The polymer addition proves to be useful in solving printing issues, such as nozzle clogging, as well as improving the structural integrity and overall printing fidelity. It is believed that the development of an optimal-printing TiO₂ ink is of paramount importance towards efficient and cost effective solar cell manufacturing. Advancement of this research and technology has the potential to steer West Virginia towards a greener, affordable future.

76. Utilizing a Nicotinic Acid-Infused Dairy Cow Model to Characterize Insulin Resistance Mechanisms

Jessica Clegg (Pennsylvania)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Joseph McFadden

An increase in adipose tissue lipolysis (i.e. fat breakdown) can promote insulin resistance in dairy cattle transitioning from gestation to lactation. In turn, insulin resistance causes metabolic diseases such as hepatic steatosis and ketosis, responses that compromise milk production and animal health. Inhibiting lipolysis may be a means to reduce metabolic disease in dairy cows and improve dairy farm profitability. Furthermore, the dairy cow is an alternative in vivo model to study the mechanisms responsible for the development of type 2 diabetes. To explore these mechanisms, the effects of anti-lipolytic nicotinic acid (NA) on lipolysis and serum metabolite levels were investigated. For this pilot study, three (n=3) multiparous non-lactating Holstein dairy cows were fed ad libitum, fasted, or fasted while intravenously infused NA (5 mg/kg of body weight per hour; delivered every 20 minutes) for 32 hours. Blood was collected at routine intervals. Serum total non-esterified fatty acids (NEFA) and glucose were determined colorimetrically, while gas chromatography-based mass spectrometry was utilized to qualitatively profile serum metabolites with a non-targeted metabolomic approach. As expected fasting increased the circulation of total NEFA as well as individual fatty acid acids (e.g. palmitic acid) in cows (i.e. lipolysis); however, lipolysis was suppressed by intravenously infusing NA. Indicating a dramatic shift in catabolism, we detected a compensatory increase in circulating amino acids in NA-infused fasted cows, relative to fed or fasted cows. For example, leucine, valine, isoleucine, and glycine were elevated in NA-infused fasted cows. We also observed an increase in circulating urea and ornithine in cows infused with NA, suggesting an upregulation of urea cycle activity and nitrogen excretion. We did not observe changes in circulating glucose thus demonstrating the ability of the cow to maintain glucose homeostasis under anabolic and catabolic physiological states. In conclusion, intravenously infusing NA can be a means to shift catabolism away from adipose tissue breakdown and towards muscle tissue degradation. Whether increasing NA availability in cows may be a means to lower NEFA supply and improve insulin sensitivity during the transition from gestation to lactation is currently being investigated.

Funding: USDA Agriculture and Food Research Initiative, WVU SURE, WVU Davis College

77. Comparing Effects of Instructive Feedback in Different Contexts on Skill Acquisition for Children with Autism

Hanah Conlan (New Hampshire)

Institution: West Virginia University

Field: Psychology

Faculty advisor: Regina Carroll

Autism Spectrum Disorder (ASD) is a neurological condition that causes deficits in communication and social skills, and also makes it difficult for persons to learn. A widely used teaching procedure for individuals with ASD is discrete trial instruction. Discrete trial instruction is a structured one-on-one teaching approach consisting of breaking complex skills into smaller subskills and teaching each subskill separately. Instructive feedback is a procedure that has been shown to increase how quickly skills are learned. Instructive feedback involves incorporating secondary targets, which the child is not required to respond to, into an instructional trial. For example, if the skill being taught is labeling pictures, the instructor would hold up a picture of an apple and ask the child, "What is it?" This is the primary target. If the child says, "apple," the instructor would provide praise and allow the child to play with a preferred toy. While that child is playing with the toy, the instructor would say, "An apple is a fruit." This would be the secondary target. The child does not need to respond to the secondary target, and the instructor would not provide reinforcement if the child did respond. Research has shown that children will learn some of the secondary targets without direct teaching; thus, using instructive feedback has the potential to double the number of skills learned at a time. Few studies have evaluated the effectiveness of instructive feedback for children with ASD, or the conditions under which children with ASD are likely to learn with instructive feedback. The purpose of this study was to extend previous research evaluating instructive feedback on learning for children with ASD. Specifically, we measured how quickly a child with ASD learned secondary targets when they were presented with and without primary targets in a one-on-one teaching format, and when they were presented during unstructured play. The results showed that learning was most efficient when we presented secondary targets within a one-on-one teaching format. The participant learned the secondary targets when they were presented during an unstructured play period; however, more training sessions were required. Overall the results of this study suggest the use of instructive feedback could potentially increase the capacity and speed to which children with ASD learn.

78. Critical Thinking Skills in Non-Calculus Ready First Year Engineering Students

Anika Coolbaugh (Pennsylvania)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Lizzie Santiago

Attrition is high among first year engineering students that are not calculus ready. These non-calculus ready students start college not only with the disadvantage of lacking proper calculus skills, but they also are not exposed to engineering concepts early in their education. These students tend to migrate out of engineering at a higher rate in comparison with calculus ready students or leave college without finishing a degree. Most institutional efforts and resources are allocated to engineering students that are calculus ready. In order to fill this gap, it has become necessary to develop a course that serves multiple purposes. First, it must introduce the students to engineering, the engineering design process, and critical thinking skills. This will serve the purpose of helping each student develop an engineering identity during their first year of college. Second, the course must be able to combine engineering and critical thinking skills with mathematics in order to prepare the students for higher level courses. We expect that with the development of these skills, higher retention rates of these non-Calculus students could be observed. A course of this nature has been implemented for the first time at West Virginia University in Fall 2015. Engineering projects, assessments, lectures, and in class activities have all been designed in order to promote critical thinking and in order to teach the Conceive, Design, Implement, and Operate (CDIO) Product Design Method. At the completion of the course, the work done by the students was analyzed and a critical thinking test will be administered in order to determine the success of the course in improving students' critical thinking skills. This work summarizes the implementation of the course, the course material developed, and illustrates how critical thinking skills were measured in participants in the study. Preliminary data will be presented. Administrators and Institutions in need for methods to increase the retention and graduation rate of non-calculus ready students will benefit from attending this presentation.

Funding: National Science Foundation

79. Phosphate Absorption from Acid Mine Drainage with Iron (III) Hydroxide and Aluminum Hydroxide Filtration

Casey Dolan (Ohio County, West Virginia)

Institution: West Virginia University

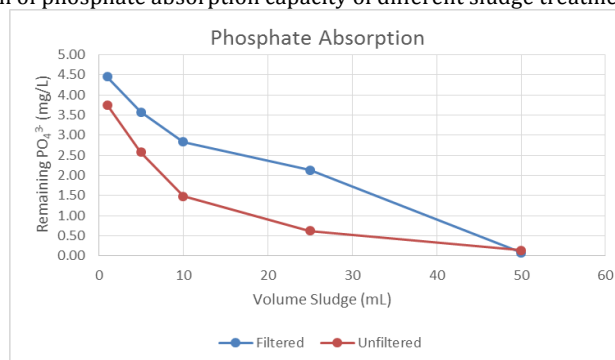
Field: Environmental Studies

Faculty advisor: Lian-Shin Lin

Excessive loads of nutrients including phosphate have led to hypoxic zones in receiving waters in the U.S. (e.g., Gulf of Mexico, Chesapeake Bay) and worldwide. According to the Environmental Protection Agency, West Virginia has, within its borders, over 2,200 stream miles impacted by acid mine drainage. Our goal is to address both issues through technology innovation that promotes environmental sustainability. In this study, our objective is to turn acid mine drainage as environmental liability into a resource for producing useful sorbents for retaining phosphate from various waste sources. Acid mine drainage sludge, which consists of precipitated iron (III) hydroxide and aluminum hydroxide, can effectively absorb phosphate ions by way of ionic interactions. This study is to engineer a filtration system that utilized the acid mine drainage sludge to prevent excessive loads of phosphate loads into natural waterways.

The iron (III) hydroxide and aluminum hydroxide, that make up the acid mine drainage sludge, were precipitated from the stream water using pH manipulation. We have experimentally confirmed that the hydroxides effectively absorb and remove phosphate ions from the water. Using colorimetric spectroscopy, it was determined that dewatered, unfiltered sludge absorbed phosphate ions more effectively than the vacuum filtered sludge. The graph below shows the difference in absorbing capacity of the two treatments of sludge. In an attempt to design a practical phosphate filtration method that can be applied in the field, we have experimented with column filtration techniques using various additives to alter flow rate. We predict that specific additives could increase the efficiency of the filtration system.

Figure 1. The comparison of phosphate absorption capacity of different sludge treatments.



Funding: WV Department of Environmental Protection's Additional Grant Opportunities of the Nonpoint Source Program

80. Leaf Angle Phenology of Twelve Central Appalachian Tree Species: Implications for carbon and energy fluxes

Evelin Flamenco (Maryland)

Institution: West Virginia University

Field: Geography

Faculty advisor: Brenden McNeil

The effects of temperate forests on the global cycles of carbon and energy depends in part on human actions, but also strongly upon how individual tree species adjust to the novel environmental conditions of the Anthropocene. In this study, we seek to identify how one adaptation, the inclination angle of leaves, differs by species and season. Leaf angle is known to have important effects on forest albedo, photosynthesis, and evapotranspiration, but there is relatively little data on its variation among species, seasons, and environmental gradients. For this study we employed a relatively new technique for using an electronic protractor to measure leaf angles on leveled digital photographs of the upper canopy of trees. From a suite of observation platforms (e.g. fire towers, bridges) in the Central Appalachian Mountains, USA, we measured leaf angles on the same set of marked branches each week (one platform) or month (5 platforms) throughout the 2015 growing season. Based on over 7,000 measurements taken from 12 tree species, we found significant differences in mean leaf angle, and leaf angle distribution between species, location, and observation time. We discuss these empirical results in light of an emerging theoretical framework that positions leaf angle phenology as a functional trait that is not only an essential part of the adaptive resource strategy of each tree species, but also could be used to better constrain model predictions of energy and carbon fluxes from temperate forests in the Anthropocene.

Funding: NASA West Virginia Space Grant Consortium

81. Maximizing Sarcoplasmic Protein Recovery Yield During pH-shift Protein Recovery Process

Jordan Garry (New Jersey)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Jordan Garry

The rapid growth of the human population and the threat of protein malnutrition contribute to the strain on fish stocks to the point where sustainability comes in question. With overexploitation being a global issue we must utilize our resources more efficiently. Most protein recovery processes only look to recover the myofibrillar protein (MP); however, muscle tissue also contains water soluble, sarcoplasmic protein (SP) in the process water that is often overlooked and discarded. The purpose of this study was to determine at which stage of a pH shift protein recovery process would recover the most SP. Ground silver carp (*Hypophthalmichthys molitrix*) was diluted 1:3, filtered and proximate composition of dilution water was determined (dry basis). The remaining paste was diluted 1:6, pH was shifted to 12.3, MP was solubilized and insoluble fractions were removed by centrifugation. MP was precipitated at pH 5.5, recovered by centrifugation and proximate composition of process water was conducted (dry basis). Initial dilution water contained 8g/mL protein. Proximate composition of the SP dilution water contained 62.6% protein, 17.7% lipid and 12.1% ash. Protein recovery yield was significantly higher in the SP dilution ($p < 0.05$) than that of the process water (13.0% vs. 8.47%). Results of this study show that best SP recovery occurs during the initial dilution step. Strategies to increase purity of recovered protein will focus on lipid reduction in the final product. Reclaiming SP can be an added source of nutritional value in protein deficient foods.

Funding: National Institute of Food and Agriculture

82. Watershed characterization with specific focus on nutrient concentration and acid mine drainage

Nicole Hegele (Raleigh County, West Virginia)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Lian-Shin Lin

Recognizing acid mine drainage (AMD) and nutrient concentrations have prohibited growth and stability of flora and fauna and prevent human recreation, this study was conducted to characterize the water quality of the main stem and major tributaries within the West Run Watershed. Water quality along the main stem meets regulations for human recreation only between Ackerman Road and the confluence. Mass loading of sulfate (40mg/s) at the confluence exceeds the expected value (14mg/s), indicating failure to sample all AMD input. None of the tributaries exhibit above standard nutrient levels, however, algal growth within the Burroughs tributary suggests excess. Two tributaries are impacted by AMD. The Pines tributary displays high concentrations of iron, (8.70mg/L), aluminum (7.50mg/L), and phosphate (0.15mg/L), approximately 200m above its mouth. Downstream, these levels decrease with concentrations of 5.40mg/L, 6.28mg/L, and 0.06mg/L respectively. While these concentrations change proportionally, sulfate concentrations remain almost constant, between 340mg/L and 360mg/L respectively, indicating no dilution. This indicates iron and aluminum hydroxides are sorbing phosphate and precipitating, improving water quality. This suggests contaminants have the potential to remediate streams.

Funding: National Science Foundation

83. RNA-seq Reveals Differential Gene Expression in Abomasal Lymph Node during *Haemonchus Contortus* Infection

Jessica Keenan (Kanawha County, West Virginia)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Scott Bowdridge

Gastrointestinal nematode parasitism (GIN) of sheep is responsible for significant production losses worldwide. Most notable is *Haemonchus contortus*, a hematophagous trichostrongylid nematode that parasitizes the abomasum of sheep and results in severe anemia, hypoproteinemia, submandibular edema, and often death of the host. St Croix hair sheep possess remarkable resistance to this parasite and can eliminate the parasite very rapidly, while other breeds of sheep are unable to do so. Resistance observed in St. Croix sheep is largely thought to be immune-mediated, but underlying immunological mechanisms regulating immune responses to this parasite are not well-defined. Abomasal lymph nodes become larger in these parasite-resistant than the susceptible sheep during *H. contortus* infection, thus the purpose of this study was to employ RNA-sequencing technology to explore differences in lymph node gene expression. Abomasal lymph nodes were collected 7 days after *H. contortus* infection in 3 St. Croix (STC-resistant) and 3 Dorset crossbred (Dx-susceptible) lambs. RNA-seq analysis identified 51 genes differentially expressed between breeds ($P < 0.1$). Specifically, 14 genes were involved in immunological processes, of which 12 were upregulated in Dx lambs. Genes upregulated in STC lambs included ontogenies such as biological regulation, cellular process, developmental process, and metabolic process. Since *H. contortus* infection is nearly resolved in STC lambs by day 7, downregulation of immune genes would support the conclusion that immune responses are being suppressed at this point. Greater expression of immune-related genes suggests that Dx lambs are beginning to generate immune responses in the local lymph nodes by day 7. These data further demonstrate that susceptible sheep generate a delayed immune response to *H. contortus* infection, permitting their establishment. Improved understanding of mechanisms involved during GIN infection will provide potential targets for immunomodulation. This could lead to a method of stimulating an immune response that would effectively combat *H. contortus* infections in GIN susceptible sheep and overcome economic losses.

Funding: West Virginia University

84. Video Modeling's Effect on Play between Preschoolers with Autism Spectrum Disorder and their Peers.

Patrick Kelly (Ohio)

Institution: West Virginia University

Field: Education

Faculty advisor: Amy Root

The purpose of this study was to examine the quality and quantity of social interactions between preschoolers with autism spectrum disorders and their peers that are typically developing before and after an intervention. This area of study is important given the increase of children identified with autism spectrum disorder coupled with the push for inclusive preschool experiences. As more students with disabilities are being educated in inclusive settings, it is imperative to train peers that are typically developing in effective strategies for interacting with their peers with autism spectrum disorder. The behaviors promoted in this study have the potential to break down social barriers present between children with autism spectrum disorder and their peers, and cultivate a socially reciprocal, inclusive learning environment. Data were drawn from children at two schools in Monongalia County, WV. Specifically, target children that were typically developing and children with autism spectrum disorder were observed during freeplay during a baseline assessment. After baseline was achieved, children participated in a video modeling intervention where strategies and demonstrations of interacting with children with autism spectrum disorder were depicted in a video observed on an iPad immediately prior to entering freeplay. Different strategies were presented in separate videos. The play behaviors of children who are typically developing were coded in a variety of ways. Of interest to this study were the children's time spent playing with children with autism spectrum disorder (cooperative play), as well as how they responded when children with autism spectrum disorder's asked them to play (accept the play bid, ignore the play bid, or reject the play bid). Data analyses will be conducted to compare baseline to post-intervention mean levels of play behaviors, as well as examine the mean levels of responses to invitations to play from the children with autism. It is expected that the findings of this study will provide information about how to encourage typically developing children to play with children with disabilities. This study could have implications for fully inclusive classrooms by supporting all students, regardless of their challenges, have the opportunity to interact and play with peers trained in encouraging participation and social play. By modeling appropriate play behavior, the strides made between children with autism spectrum disorder and peers who are typically developing could improve the outcomes of children with autism spectrum disorder in their future classrooms.

Funding: Committee on Research, Research Grants, and Publications

85. Wood boring ambrosia beetles, their fungal associates, and the diseases they cause

Lori Koenick (Maryland)

Institution: West Virginia University

Field: Biology

Faculty advisor: Matt Kasson

Ambrosia beetles are one of several insect groups that have been farming fungi for millennia. Contrary to popular belief, these wood-boring beetles do not consume wood; rather they excavate tunnels inside wood to grow fungal gardens used to feed their developing offspring. Occasionally, these complex interactions among beetles, fungi, and trees can be detrimental to the tree host. *Euwallacea* ambrosia beetles, a focus of our lab, have been reported to kill healthy trees, including avocado and boxelder, and are invasive pests in the United States. Female ambrosia beetles carry their fungal symbionts in specialized pouches called mycangia. While analyzing mycangia of *Euwallacea validus* in lab, we have found two fungal genera consistently inside. We know that these genera- *Fusarium* and *Raffaelea*- are food sources for the larva. Our lab has also discovered two other fungal species in or around the mycangia belonging to two different genera, *Graphium* and *Paracremonium*. Based on molecular evidence, we know that these two fungal species are previously unknown to science. My job this year has been to characterize the two species and perform pathogenicity testing to confirm whether or not these fungi can cause disease on trees. Characterizing fungi entails growing them on different media types to see what they look like on different diets. We measured colony diameters and took photographs. The media used includes oatmeal agar and potato dextrose agar. Spores measurements were taken and molecular sequencing was done on all strains to compare our species with others in the same genera. Pathogenicity testing was done on two tree species- tree-of-heaven and boxelder. Tree-of-heaven is an invasive tree that is well established across the United States, whereas boxelder is a native tree in the Maple family. By performing pathogenicity tests, we determined if fungal associates of these beetles pose realistic threats to our forests. Testing entailed inoculating 40 stems of each tree with different fungi or a negative control. After six weeks, we destructively dissected the stems and measured canker diameters. Large cankers indicate that the fungus is a disease-causing agent. Our results indicate that the *Graphium* spp. is capable of causing disease on both hosts. By characterizing and testing these fungi, we are enhancing our understanding of the role these beetles and their fungal partners may play in destabilizing forest health.

Funding: West Virginia University

86. Characterization of a Novel Zinc Finger Protein Using Molecular Techniques

Kristen Mastrantoni (Hancock County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Jianbo Yao

Zinc finger transcription factors (ZNF) containing the Kruppel Associated Box (KRAB-ZNF) belong to a large, highly conserved class of proteins encoded by mammalian genomes. ZNFs function in the cell as regulators of transcriptional activity by controlling gene expression of important functional processes such as embryonic development. Recently, an abundant transcript exclusive to the mammalian oocyte has been identified as a KRAB-ZNF containing nine zinc finger motifs at its C-terminus. The discovery of this novel protein, ZNFO, has prompted further investigation into its functional role. A luciferase assay was conducted to confirm the predicted repressive function of ZNFO. Luciferase expression was significantly lower ($p < 0.05$) in cells transfected with a ZNFO containing vector, suggesting that ZNFO is a repressor of transcriptional activity. Prior subcellular localization experiments have demonstrated the nuclear localization of ZNFO. Subcellular localization experiments using truncated variants of the gene were conducted to determine the domain responsible for nuclear localization of this protein. Preliminary results suggest that the first three zinc finger motifs are involved in ZNFO nuclear localization. These experiments will establish a basic characterization of ZNFO and will provide further insights into its function. It is suspected that this novel protein may be a key regulator of embryonic genome activation. Insight into the biological function of the novel ZNFO may enable its use as a biomarker to predict embryonic loss.

Funding: NSF Louis Stokes Alliance for Minority Participation

87. Staff-Child Interaction Therapy: Measuring the Effects of Client Diagnosis on Therapist-Client Relationship and Child Behavior

Kelsey McCoy (Greenbrier County, West Virginia), Allison Thompson (Monongalia County, West Virginia), and Jana El-Khatib (Putnam County, West Virginia)

Institution: West Virginia University

Field: Psychology

Faculty advisor: Cheryl McNeil

Staff-Child Interaction Therapy (SCIT) is an in-home adapted version of the evidence-based treatment, Parent-Child Interaction Therapy (PCIT). PCIT is a parent-training program designed to reduce child disruptive behavior problems and improve the parent-child relationship. The purpose of this study is to investigate the effect that an Autism Spectrum Disorder (ASD) diagnosis poses on the effect of SCIT on the therapist-client relationship from pre to post treatment over a 14-week period, as evidenced by the Student-Teacher Relationship Scale (STRS; Pianta, 2001). This study also aims to examine the effect of an ASD diagnosis on the effect of SCIT on child disruptive behavior from pre to post, as evidenced by the Eyberg Child Behavior Inventory (ECBI; Eyberg, 1974). It is hypothesized that therapists implementing SCIT with a client diagnosed with a disruptive behavior disorder will demonstrate a greater improvement in therapist-client relationship compared to therapists implementing SCIT with a client with a comorbid diagnosis of a disruptive behavior disorder and ASD. It is also hypothesized that therapists implementing SCIT with a client diagnosed with a disruptive behavior disorder will demonstrate a greater reduction in externalizing behavior compared to therapists implementing SCIT with a client with a comorbid diagnosis of a disruptive behavior disorder and ASD.

88. Childhood Adversity is Associated with Mental Health and Drug Abuse in Adulthood

Courtney McDonald (Monongalia County, West Virginia),

Institution: West Virginia University

Field: Psychology

Faculty advisor: Nicholas Turiano

Title: Childhood Adversity is Associated with Mental Health and Drug Abuse in Adulthood Authors: Courtney McDonald & Nicholas A Turiano Out of every 1,000 children in the United States, 12.3 are victims of child abuse. Child abuse is not the only negative event a child can experience growing up. There are many other “childhood adversities” that can have long lasting negative effects on the child’s development. However, not much research has examined just how far reaching these negative effects can persist into adulthood. Thus, in the current study we utilized data from the federally funded national Midlife Development in the U.S. Study (MIDUS) to examine how several adversities experienced in childhood influenced later life depression and drug use between the ages of 25-75. The study included measures on 5 different types of adversities children could have experienced as follows: physical abuse, emotional abuse, low socioeconomic status, disruptions in family structure, poor physical and emotional health during childhood. We also examined clinically relevant depression levels and also whether someone was using illegal drugs. Using data from approximately 7,000 participants from across the entire U.S. and found that individuals with greater levels of adversity in early life had higher depression scores and were also more likely to abuse illegal drugs. Emotional abuse was the most strongly related type of adversity to both depression and drug use. The current findings provide evidence that adversity experienced early in childhood has lasting effects into adulthood. Since some participants were in their 70’s these effects lasted up to approximately 50-60 years. By understanding these harmful outcomes, programs may be implemented to either prevent childhood adversity or monitor those who were exposed to such bad childhoods. This type of research is even specifically important to West Virginia because its residents have very high levels of depression and drug use, and there are many children growing up in households where adverse situations occur. I hope to continue studying this topic in graduate school and hopefully I can help improve our understanding of how childhood experiences influence the development and long term outcomes of those abused.

89. The Effect of Height and Gender on the Range of Arm Motion

Ryan North (Virginia)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Marvin Cheng

The long term goal of this study is to design and fabricate an interactive wearable robotic device that can help stroke patients or senior adults to rehabilitate and perform in their ADLs (Activities of Daily Living). To achieve this goal, the proposed robotic device needs to be portable and light weight. One major consideration for such device is having enough degrees of freedom to maintain a minimum range of motion. The research topics of this project include: hardware development, firmware and controller development, and identification and modeling of human arm motions. In the mechatronic system research lab, we have developed a prototype of the wearable robotic device, as shown in Figure 1.

This pilot study will focus on 5 specific motions that the participants are required to complete. The selected motions such as pick up an object overhead, are designed to simulate motions that are completed on a daily basis. Furthermore, these motions target the motions that are believed to be the most important when completing daily activities. The trajectories of these 5 motions are acquired from healthy adults with different physical conditions, such as height, gender, and age. The participants' motions were recorded using a Microsoft Kinect.

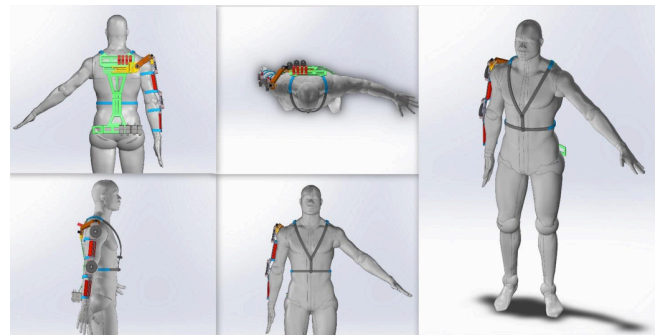


Figure 1. CAD drawing of the proposed robotic device.

The Kinect records the trajectories in which the participants complete each of the tasks. It does this through recording the positions of selected points using optical and infrared sensors. The data was then exported into MATLAB for analysis using Dynamic Time Warping (DTW) so that the trajectories can be compared within the same time interval. This allows relationships between the trajectories with respect to time to be found. The trajectories of the same motions are divided into individual groups based on the participants' physical conditions. A similarity index (SI) was used to evaluate the similarities among these groups. From the analyzed data, the significant trajectories are given more emphasis as they will restore more motion to future patients. Trajectories with better SIs will be used to generate reference trajectories for patients with similar physical conditions. These derived expressions will then be implanted into the robotic supplement.

Funding: McNair Scholars Program

90. Modeling and Simulation of a Selected Pharmaceutical Process

Talita Nunes de Faria (Brazil)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Fernando Lima

Andreia A.B. Carneiro, Talita N. de Faria, Shuyun Li and Fernando V. Lima The majority of processes in the Pharmaceutical Industry are batch. However, companies are currently analyzing the change of process operations from batch to continuous. There are many advantages and disadvantages regarding this change. In batch processes, the quality control is easier than in continuous processes, and it can be monitored at each completed batch. Another advantage of batch processes is that early capital investment for these processes is typically lower than for continuous processes since no investment for control and optimization purposes are required. However, some characteristics of continuous processes have been becoming increasingly attractive. In continuous processes, scale-up is less necessary and thereby the time of production for a certain amount of product becomes shorter. Furthermore, in this type of process, the human factor is minor, and it has a better control. The yields are better and the engineers do not have to deal with failed batches. The modeling and simulation of pharmaceutical processes can be a good way to compare the continuous against the batch process operation, which can help pharmaceutical companies make a wise decision even at the early development stage. Running the process in a simulated environment can reduce the use of chemicals, and thus the company would spend less resources and time with experiments. In addition, pharmaceutical processes can be optimized using developed process models based on desired properties. The optimization needs to consider some characteristics of the process such as economics and operating constraints, and product material properties. The objective in this presentation is to model and simulate a selected continuous pharmaceutical process from the literature (Wong, Sze-Wing et al., 2014) to identify the best operating regime for this system. The simulated chemical process consists of 4 reactions, and the kinetic properties are provided to complete the simulation. The first operation mode consists of two 100 mL CSTR reactors (continuous stirred tank reactors) in series with a residence time of 20 minutes in each reactor. The second mode corresponds to a batch process. Modeling and simulation studies are performed to compare both processes under similar conditions in MATLAB. Different scenarios will be presented aiming the cost minimization and performance optimization for this pharmaceutical process.

91. The British Press and Humanitarian Efforts to Aid Distressed Civilians During the Napoleonic Wars

Christine Odom (Monongalia County, West Virginia)

Institution: West Virginia University

Field: History

Faculty advisor: Katherine Aaslestad

What motivates people to offer aid to others facing displacement, distress and impoverishment due to war? This question is very relevant today, yet remains an important topic for historians. Although the origin of humanitarian organizations to help civilians in war torn regions is often attributed to the 20th century, this research project suggests that early versions of transnational philanthropic organizations emerged in the early 19th century. The final years of the Napoleonic Wars devastated many regions within German Central Europe; organizations in Great Britain raised money and sent aid to civilians in the regions particularly under duress. In order to determine the extent and methods of these relief projects directed toward war-ravaged cities and areas following combat or extended siege, this research project focused on public discussions of the wars and their consequences in the British press. Research focused on accounts of civilian hardships, efforts to rebuild damaged buildings and communities in places hard hit by fighting, and financial reports regarding sums sent to distressed cities. In particular, Parliamentary records, newspaper articles detailing civilian distress and displacement, press reports of German appeals for help, and published sermons imploring Christian charity to aide those less fortunate were investigated, read and analyzed. The research period in question emphasizes the years between 1813 and 1815, but also extends to the post-war years to explore how long public awareness of the wars and their costs endured in the British public sphere. This research also focused on British awareness of the war in northern Germany, due to the siege of Hamburg, and Saxony, site of the Battle of Leipzig. These were the areas that received the most financial support from the British organizations. After several months of extensive research of online archives and databases, an early 19th century humanitarian movement emerged that included a wide variety of social players: German expatriates, merchant networks, women's associations, religious organizations like the Quakers, abolitionists, and well-connected individuals in British society and politics. This research project continues to investigate the role the British press played in contributing to a general awareness of the adversity that civilians faced on the war-ravaged continent.

Funding: WVU History Department

92. STF-1 CubeSat Mission GNSS Experiment Flight Software Design and Testing

Nicholas Ohi (Monongalia County, West Virginia)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Jason Gross

Simulation To Flight 1 (STF-1) is a CubeSat mission being developed by the NASA Independent Verification and Validation (IV&V) Program and West Virginia University and will be the first space mission from the state of West Virginia. NASA IV&V's mission objective is to use STF-1 as a demonstration platform for their NASA Operational Simulator (NOS) technology which enables hardware simulation in a software environment. This technology improves NASA IV&V's ability to perform verification and validation on NASA missions. West Virginia University will be flying four science payloads on STF-1 which work to achieve three science objectives. One of the science objectives is improve Precise Orbit Determination (POD) technologies for CubeSat platforms. Currently, only meter-level accuracy has been demonstrated on a CubeSat, so the goal of the Global Navigation Satellite System (GNSS) part of the navigation objective is to increase the accuracy of POD on CubeSat platforms down to the centimeter-level. The improved POD accuracy will come from post-processing of the data using the GNSS-Inferred Positioning System and Orbit Analysis Simulation Software (GIPSY-OASIS) package developed by the NASA Jet Propulsion Laboratory (JPL). This project is focused on the development of the flight software (FSW) to be flown on STF-1 to interface with the GNSS receiver, provide an onboard GNSS time and navigation solution for the CubeSat systems, and relay GNSS data to the ground for POD processing. The FSW will interface with a NovAtel OEM615 GNSS receiver onboard the CubeSat, which will collect both dual-frequency GPS and GLONASS data. The FSW needs to be developed so that it can reliably operate on a CubeSat platform without encountering errors that require user intervention. Since the CubeSat will be in orbit, the ability for humans to resolve errors will be very limited, so creating robust software that can be thoroughly tested before flight is critical. The FSW is written in C using Core Flight System / Core Flight Executive (CFS/CFE), a set of free, open source libraries developed by the NASA Goddard Spaceflight Center for running flight software on satellite missions. The challenges in designing and writing the FSW involve accounting for all possible sources of errors and creating handlers that prevent the FSW from crashing or producing undefined behavior. The research goals include enhancing the capabilities of affordable technology for attitude and orbit determination on microsatellites, which will greatly enhance the opportunities for inexpensive but impactful space-based scientific research using microsatellite technology.

Funding: NASA West Virginia Space Grant Consortium

93. Statewide Dissemination of a Culinary Skills, Family Mealtime and Physical Activity Program through HSTA

Matthew Parsley (Mingo County, West Virginia)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Melissa Olfert

Introduction: iCook 4-H is a five-year, multistate research project that seeks to reduce the prevalence of childhood obesity. The eight session curriculum emphasizes three main concepts: cook together, eat together, and play together among children 9-11 and their adult food preparer. The goal is to educate families on healthy eating, physical activity, and the importance of spending quality time together. iCook follows the fundamentals of community-based participatory research (CBPR) where the dyad pairs, local and state leaders came together to help develop and implement the curriculum and the research intervention. The objective of this study is to investigate the feasibility of disseminating the iCook program among a high school-led research program. **Methods:** Following pilot testing of dissemination using teens as teachers, iCook moved into a full-state dissemination phase in August 2015. For West Virginia, iCook was integrated within high schools through Health Sciences and Technology Academy (HSTA) clubs. HSTA, a high school program that encourages minority participation in STEM fields, requires students to conduct a research project each year and present at the annual symposium. By delivering the iCook sessions, HSTA students are able to experience real, communal-based research from which they can develop research questions. **Results:** The concept of iCook 4-H was presented to HSTA teachers during their annual, statewide meetings. Eleven teachers agreed to incorporate the iCook into their respective clubs. Incentives were given to these clubs which included a video camera, staff t-shirts, curriculum and conversation meal starters. Each teacher received iCook training and instruction on how to train their HSTA students. Quizzes were developed for the students to guide them in recruitment and leading sessions. Session start dates is varied between clubs where some initiated iCook during the fall semester, while others in the spring semester. Fidelity, a value signifying the accuracy of iCook session delivery, will be measured and analyzed after all eight sessions have been delivered. This will gauge the actual delivery from the HSTA students, and assess if the curriculum was presented as intended. **Conclusion:** By collaborating with HSTA, iCook 4-H has the opportunity to be introduced into a wide spectrum of communities throughout a state that has a high prevalence of obesity. Additionally, the experience gained by the HSTA students is the first step into understanding the significance and practicality of CBPR.

94. Education, Income and Psychology can affect the Immune System

Robert Ralston (Pennsylvania)

Institution: West Virginia University

Field: Psychology

Faculty advisor: Nicholas Turiano

When considering the connections between psychology and physical health, many think only of ways in which biology affects our mental life. This happens in a variety of circumstances, like when medications alter how one feels or when low blood sugar makes it difficult to concentrate. However, research is now showing that this relationship cuts both ways – psychological factors can affect our physical health over time. Therefore, discovering how our mental life relates to physical wellness is a major task for those who wish to have a thriving, healthy population. For our study, individuals from low socioeconomic (SES) groups are those that have low levels of education and/or do not make much money. These individuals are at a greater risk of committing crimes, being arrested, experiencing poorer health, and also have shorter life expectancies than their wealthy and educated counterparts. We used data from over 7,000 adults from across the U.S. from the federally funded National Survey of Midlife Development in the U.S. Study (MIDUS) to examine whether low SES was associated with their immune function. Examining participants blood, we found that individuals from lower SES groups had higher levels of IL-6 (higher levels of this biomarker suggest worse immune function). However, we also examined psychological factors of these poor and uneducated participants. We found that participants who perceived they had a large amount of control over their lives, even though they were poor and uneducated, had more healthy immune functioning than those who thought things were out of their control. In fact, you could not recognize a difference between the lowly educated versus the highly educated if the individual believed they had control over their life and health. This finding is useful to anyone who attempts to help improve the health of the worst off among us. In addition to providing medications and healthcare, public solutions designed to increase perceptions of control among the population could be hugely beneficial. This is especially notable for a state like West Virginia, where health solutions are desperately needed by many. To help this project, in future research, we or others could attempt to determine the specific ways in which education, income, and control beliefs can influence changes in immune functioning.

Funding: West Virginia University

95. The Association between Adolescent Sleeping Patterns and Use of Electronics before Bed

Mina Shahbodaghi (Ohio) and Lauren Alvis

Institution: West Virginia University

Field: Psychology

Faculty advisor: Aaron Metzger

Most adolescents today are not sleeping a full eight hours due to varying reasons, a major one being use of electronic devices before bed. Receiving enough sleep during adolescence is critical for neurocognitive development, repairs of the body, and regulations of the body's systems (Bohpal et. al, 2014). Sleep is also strongly correlated with adolescents' behavior, academic performance, sports performance, and other areas of their lives. By using electronics before bed, there is a possibility that this hinders the body's ability to fall asleep faster, and this may produce long-term side effects. While some studies have found that electronics do not have an astronomical effect on the average adolescent's sleeping patterns, other studies have argued otherwise, thus more research is needed to further assess this association. According to a study conducted by Peter Polos et al. (2015), out of approximately 3,000 adolescents, 56.7% texted/tweeted/messaged in bed, and 20.8% awoke to texts. These findings were also strongly associated with poor academic performance, daytime sleepiness, insomnia, and shorter amounts of sleep. These findings suggest that there is a strong correlation between electronic use and shorter amount of sleep in adolescents. The purpose of this study is to determine if adolescents' use of electronics at bedtime can interfere with sleeping patterns and lead to sleep deprivation. This project is exploring two specific questions: 1) Is use of electronics before bed associated with sleeping patterns in adolescence? 2) Is lack of sleep in teens associated with academic performance and behavioral issues? Data for this study comes from high school students in a university town in West Virginia. In this survey, students completed surveys which includes questions about their bedtime, sleep patterns, use of electronics before bedtime, and how often they feel tired as a result of not sleeping enough. Students also reported academic performance and problem behaviors. Information derived from this study will allow people to better understand the correlation between sleeping patterns and electronic use of devices at bedtime. This may have important implications for adolescent development which could help to inform health-promoting interventions.

96. Allelopathic effects of horseradish root extract on onion root

Tyler J Simpson (California)

Institution: West Virginia University

Field: Agriculture

Faculty advisor: Kang Mo Ku

Previous study revealed that allyl isothiocyanate which is the hydrolysis product of the glucosinolate, sinigrin, prevalent in horseradish root and leaf tissues has allelopathic effects on various plants. The sinigrin in horseradish root or leaf tissue could be utilized as a biological weed control agent. Thus, this study measured the effect of horseradish extract on onion root growth, cell cycle arrest ability, and reactive oxygen species (ROS) accumulation in order to find out the mechanism of allelopathic effect by using onion root as model subject. Onion bulbs were purchased from a local grocery mart. The old onion root was cut to induce new onion root growth. After two days, the most uniform onions were chosen based on their daily root growth and sorted into four groups with five biological replications. The onion bulbs were placed in 240 ml transparent cups with 0.1% horseradish extract (HRE), 0.2% HRE, 0.3% HRE or distilled water. Physiological changes such as root growth and ROS accumulation (by using nitroblue tetrazolium, NBT) were observed and a mitotic index analysis was done by staining the root tips with Schiff reagent two days after treatment and observing the ratio of cells that were in the various stages of mitosis. As a result, one and two days after either distilled water or HRE treatments, the onion bulb root growth per day was significantly inhibited by HRE treatments. One day after treatment, the root growth of onion bulb per day of control, 0.1% HRE, 0.2% HRE, and 0.3% HRE were 1.38, 0.31, 0.21, and 0.05 cm, respectively ($p < 0.001$). Two days after treatment, the root growth of onion bulb per day of control, 0.1% HRE, 0.2% HRE, and 0.3% HRE were 0.91, 0.27, 0.16, and 0.05 cm, respectively ($p = 0.003$). The percentage of cells in interphase was significantly increased by treatment with 0.2% and 0.3% HRE compared to the control. This suggests that the HRE treatments decreased cell division rate. From NBT assay, there was lower ROS accumulation in the HRE treated onion roots in comparison to the control treated roots after two days of HRE treatments. As HRE concentration was increased, there were more dead regions of onion bulb root and reduced ROS accumulation, which is required for root growth. These results suggest that the allelopathic effect of HRE treatments on onion root is involved in cell cycle arrest and reduced ROS accumulation.

Funding: West Virginia University

97. Determining the Role of *Jnk3* in the Migration of Cortical Interneurons During Development

Kelly Stake (Monongalia County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Eric Tucker

During embryonic development, neurons migrate from the location where they are born to the location where they mature and make functional connections with each other. One type, called cortical interneurons, undergo long-distance migration from their birthplace in the ventral forebrain to their final place of differentiation in the cerebral cortex, where they potentially regulate the transmission of neural information within cortical circuits. Deficits in the migration of cortical interneurons can alter the formation and function of cortical circuits and lead to severe brain disorders including autism, epilepsy, and even schizophrenia. Many different signaling pathways influence the migration of cortical interneurons to ensure that they reach their correct destination in the cortex. If they do not receive or respond to the proper signals during development, then they may never reach their destination and, therefore, never make proper connections in the cortex. Thus, pinpointing the molecular mechanisms underlying the migration of cortical interneurons is of great clinical importance. In the future, this could provide physicians with the means of genetic testing to predict (or better understand) an individual's neurodevelopmental disease. It could also open doors for the discovery of new therapeutic agents that could be used to treat, or even cure, neurodevelopmental diseases.

Previously, our laboratory determined that *Jnk1*, one of three c-Jun-N-terminal kinase (JNK) genes, is essential for the initial entry of cortical interneurons into the cerebral cortex. We also determined that unlike *Jnk1*, the *Jnk2* gene is not required for interneuron migration. In the current study, we evaluated the role of the third gene, *Jnk3*, in cortical interneuron migration. We employed cryosectioning, immunostaining, and confocal imaging to analyze the migration of cortical interneurons in *Jnk3* knockout embryos and their heterozygous littermate controls. Our data suggests that *Jnk3*, similarly to *Jnk2*, does not play an obligate role in tangential migration. Moving forward, we will determine whether the combinatorial deletion of *Jnk3* with *Jnk1* and/or *Jnk2* exacerbates migratory deficits. This will help resolve the contribution of *Jnk3* to cortical development and also improve our understanding of how diseases of cortical connectivity arise.

Funding: WVU STEM SURE

98. Sustainability Assessment and Simulation of Phthalic Anhydride Production from o-Xylene

Matthew Steinheimer (Maryland)

Institution: West Virginia University

Field: Engineering

Faculty advisor: Fernando Lima

The United States Environmental Protection Agency, EPA, has been increasingly regulating chemical processes for their emissions of greenhouse gases, energy consumptions, as well as other factors. The EPA has also been developing assessment tools to determine the sustainability of chemical processes. One of these assessment tools is the GREENSCOPE software (Microsoft Excel® Version), which assesses economics, environmental, efficiency, and energy aspects of processes. This tool has approximately 140 indicators in all aspects, in which the results of the indicators are shown on radar plots. These plots show the percentage values of the indicators in a radar fashion, i.e., the center of the plot represents a value of 0% sustainability and the outside edge of the plot corresponds to a value of 100% sustainability. For this presentation, a sustainability analysis is performed on the chemical process of the production of Phthalic Anhydride using o-Xylene, which is simulated using CHEMCAD. The process values needed for the GREENSCOPE assessment are exported from this CHEMCAD simulation using data mapping. Eight indicators are chosen based on their relevance to the process - two indicators from each category. The indicators chosen for this process are mass loss index, renewability material index, capital cost, total energy cost, health hazard, environmental quotient, specific energy index, and resource-energy efficiency. The obtained results show that the percentage values of these indicators for the process nominal case are 70.86%, 96.40%, 76.25%, 100.00%, 99.88%, 97.26%, 0.00%, and 100.00% respectively. The results for this study will be discussed in this presentation.

99. Modifications of leukemic cell metabolism influenced by the bone marrow microenvironment

Patrick Thomas (Putnam County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Laura Gibson

Acute lymphoblastic leukemia (ALL) is a common pediatric malignancy, with relapse of disease in approximately one third of patients. Leukemia initiates in the marrow and it is often the site where aggressive disease recurs following completion of treatment that was not entirely successful. Therefore, the bone marrow microenvironment serves as a unique protective niche in ALL. This work explores how the bone marrow microenvironment modulates the metabolism of ALL cells. Using a model including co-culture of ALL tumor cells with stromal components of the bone marrow, we observed three sub populations of ALL cells. Of the sub populations, the "phase dim" (PD) tumor cells that bury under the adherent stromal cells are uniquely resistant to chemotherapy. To characterize PD tumor cells we identified variations in their metabolic pathways that control macromolecule synthesis and proliferation. Changes in the active form of both protein kinase B (AKT) and AMP-activated protein kinase (AMPK), key metabolic regulators that control protein synthesis and lipid metabolism respectively, were observed. In addition, PD cells have a higher rate of glycolysis than cells grown in media alone. Along with providing ATP, glycolysis has the ability to produce intermediates for macromolecule synthesis, a critical step for cells poised to proliferate. Consistent with our other observations, PD cells are larger than those cultured in media alone, suggesting the PD ALL cells are generating and storing macromolecules for later use. We hypothesize this increase in metabolic activity contributes to the survival and quiescence of the PD population. Changes in the metabolism of the resilient population found in the bone marrow provide novel targets for treatments aimed at sensitizing these resistant tumors with the hope of reducing minimal residual disease and relapse. Better understanding the unique characteristics of the PD tumor cells that survive chemotherapy may help identify strategies to target this resistant population to improve patient outcomes and reduce the risk of relapse.

Funding: NIH

100. Vowels in West Virginia: A Quantitative Comparison

Emily Vandevender (Greenbrier County, West Virginia), Savannah Alberts (Monongalia County, West Virginia), and Christine Odom (Monongalia County, West Virginia)

Institution: West Virginia University

Field: English

Faculty 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 stages 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. As part of stage 2, the WVDP has been conducting sociophonetic research that focuses on the correlation between the sounds speakers produce and their social and demographic factors. Currently, we are researching Appalachian vowels with the aim of understanding how West Virginia compares to other regions. We also want to empirically investigate correlations between vowels and the gender, age, and geographical region of speakers. Though dialects in Appalachia are widely recognized, data on WV vowel systems is more limited. Vowels are a particular area of research emphasis for the WVDP because of their highly dynamic nature and tendency to shift more quickly than consonants. For this reason, vowel shifts can point to changes in identity characteristics across regions, social class differences, and the evolution of the Appalachian identity over time. In English, vowels are described in terms of three different qualities: the height of the vowel in the mouth (high, mid, and low), the advancement of the vowel in the mouth (front and back) and the roundness of the lips during the production of the vowel (rounded or unrounded). Acoustically, vowels are described by formants, which are resonances that are produced in the oral cavity during speech, and are quantified as a measure of energy with units of Hertz. Using the formant measurements for all of the vowels, a graph of the relative position of the vowels in the mouth can be constructed, which allows for the quantitative comparison of vowel systems between speakers. Praat, a program designed for analyzing speech in phonetics, was used to extract the formant values from interviews. Through analysis of native West Virginians, we have found that back vowels /u/ (as in boot) and /o/ (as in boat) are fronting in Appalachian vowel space. For this region, this feature is part of the larger Southern Vowel Shift, yet the front vowel component of this shift is highly variable, with only some speakers adopting it. These vowel changes indicate shifts in the social fabric of West Virginia.

Funding: The National Science Foundation

101. Are Positive Therapist Verbalizations Associated with Better Therapist-Client Relationships?

Emma Veshecco (Pennsylvania), Haley Glover (Monongalia County, West Virginia), and Nila Manivannan (Monongalia County, West Virginia)

Institution: West Virginia University

Field: Psychology

Faculty advisor: Cheryl McNeil

Attrition continues to be an ongoing problem in Parent-Child Interaction Therapy (PCIT), even though it is an evidence based treatment to reduce noncompliance in young children. Treatment as usual has been shown to be less effective in decreasing noncompliance compared to PCIT (PCIT; Stokes, 2014). Staff-Child Interaction Therapy (SCIT) was developed to combine the two treatments and deliver an in-home adapted service of PCIT. Approximately 40 Therapeutic Staff Support (TSS) members from Western Pennsylvania participated in the study. TSS received either the SCIT or a compassion fatigue control group. The TSS in the treatment group were trained in SCIT in a two-day workshop. They were required to reach mastery criteria for the program during these workshops in order to conduct SCIT with their clients. The TSS in the compassion fatigue received stress management techniques during the workshops but did not change the way they interacted with their clients. At every workshop, for both groups, the TSS participated in play simulations with a confederate child. Their verbalizations were recorded under the Dyadic Parent-Child Interaction Coding System (DPICS; Eyberg, Nelson, Duke, & Boggs, 2009). The percentage of positive verbalizations from all of the therapists, according to the DPICS, will be correlated with the strength of the therapist-child relationship, measured with the Therapist Facilitating Behaviors Questionnaire (TFBQ; Alexander & Luborsky, 1986). Data will be collected and analyzed by the time of the conference.

References Alexander, Leslie B., Luborsky, Lester. (1986). The psychotherapeutic process: A research handbook. Guilford clinical psychology and psychotherapy series., (pp. 325-366). New York, NY. Eyberg, S., Nelson, M.M., Duke, M., & Boggs S.R. (2009). Manual for the dyadic parent child interaction coding system (3rd ed.). University of Florida. Stokes, J. (2014). Effectiveness of community-delivered parent-child interaction therapy compared to treatment as usual. Dissertation Abstracts International, 76.

Funding: West Virginia University

102. Preconditioning Strategies Enhance Tissue Engineering Techniques for Regeneration of Human Herniated Intervertebral Discs

Shanawar Waris (Kanawha County, West Virginia)

Institution: West Virginia University

Field: Biology

Faculty advisor: Ming Pei

Human intervertebral disc (IVD) degeneration is estimated to generate 2.8% to 5% of healthcare visits in the United States alone. IVD degeneration results in economic losses surpassing \$100 billion per year in the United States, as well as significant individual suffering, resulting from lower back pain, morbidity, and disability. IVD degeneration is ostensibly induced by a progressive loss of nucleus pulposus (NP) cells, which make up the jelly-like inner core of the vertebral disc, serving to withstand compression and torsional forces. The loss of NP tissue stems from aging and chronic degeneration due to arthritis and acute injury leading to disc herniation and neural compressive damage. It is extremely difficult for damaged or inflamed NP tissue to regenerate its own microenvironment, which is vital to its survival and overall function. Replenishing autologous disc cells, or a patient's own cells, and improving the disc microenvironment have demonstrated potential to slow symptoms of IVD degeneration in vivo. In this study, NP Cells isolated from herniated disc patients (n=2, representing two typical proliferation capacities, "fast" and "slow" grown cells) were expanded in the presence of fibroblast growth factor 2 (FGF-2), hypoxia, and stem cell deposited extracellular matrix (ECM) followed by redifferentiation induction in a pellet culture system. Cell proliferation was evaluated using cell counting, proliferation index and typical surface markers. Cell redifferentiation was evaluated using biochemical analysis for DNA and GAG contents per pellet and TaqMan real-time PCR for chondrogenic markers, including types I, II, and X collagen, aggrecan, and Sox9. Our data showed that "fast" grown NP cells exhibited a different response to environmental changes compared to "slow" grown NP cells. In the "fast" grown NP cell group, hypoxia pretreatment did not significantly change cell proliferation; interestingly, ECM pretreatment yielded the largest cell number followed by the FGF group. In the "slow" grown NP cell group, preconditioning did not improve redifferentiation capacity, while ECM pretreatment significantly promoted redifferentiation capacity in the "fast" grown NP cell group. This study shows that the regenerative potential of NP cells may be dependent upon the severity of a patient's disc microenvironment. Using axial T2 mapping, patients who are receptive to cell-based therapies could be identified. These preliminary data suggest that clinical MRI images can be used as a tool to determine the feasibility of using autologous cells for NP regeneration in a particular patient, allowing for customization of treatment, maximizing redifferentiation capacity of autologous NP cells.

103. The Effects of Personal Factors on Ethical Decision Making in Consequentially Based Thought Experiments

Tara Weese (Tyler County, West Virginia)

Institution: West Virginia University

Field: Philosophy

Faculty advisor: Benjamin Brooks

The current study aims to examine the decision made by President Truman to drop the atomic bomb at the end of World War II, examining whether the decision was ethically sound and what factors may have influenced his decision. The study also examines how its findings relate to the process of choosing a leader and leadership development. Participants were given a scenario similar to the one President Truman faced and were asked whether or not they would use the atomic bomb. Eight different scenarios were used, manipulating the nationality of the victim group and whether or not the scenario occurred in a time of war or peace. Overall, males were more likely to endorse the use of atomic weapons than were females, republicans were more likely than democrats, and those who reported high levels of patriotism were more likely than those who reported medium or low levels of patriotism. The results also show an in-group bias, or that participants were less likely to endorse the use of atomic weaponry against a group of the same nationality.

104. Characterization and Discrimination of Inkjet Printer Inks by Raman and Laser Induced Breakdown Spectroscopy

Robyn Wiseman (Marshall County, West Virginia)

Institution: West Virginia University

Field: Chemistry

Faculty advisor: Patrick Buzzini

Inkjet printers are commonplace in today's society due to their widespread availability and affordable prices. They are ubiquitous and capable of producing high quality prints, so it is not surprising that inkjet technology is often utilized in the illegal production of questioned documents such as currency banknotes, fraudulent contracts, and extortion letters. Additionally, it is estimated that about 60% of the counterfeit bills confiscated by the United States Secret Service are produced with Inkjet printers. The ability to link specific printers to criminal cases is vital to the success of prosecuting the guilty parties. Currently the majority of ink analyses are done by subjective visual spectral comparisons (i.e., filtered colored light, ultraviolet, infrared reflectance and infrared luminescence) followed by an extraction of the colorant from the printing substrate for chromatographic analysis. However, this latter approach is time consuming and destructive to the evidence. Many types of ink are made of dyes, pigments or a combination of both. This chemical nature further complicates the analysis because the pigment-based inks are difficult or impossible to solubilize for conducting analytical methods such as the routine method of thin layer chromatography (TLC). In this project the fast and non-destructive instrumental analysis methods of micro Raman Spectroscopy and Laser induced breakdown spectroscopy (LIBS) were tested on eight inkjet printer inks. Raman spectroscopy detects light scattering from molecular vibrations specific to the chemical bonds. Spectra of cyan, magenta, and yellow ink components were collected for the eight ink samples using the Raman technique. Five replicates of each of the three colored spots for all samples were obtained for a total of 120 spectra. The LIBS method gathers information about the elemental profile of the analyzed samples. Five replicates were taken of the black ink components of the eight samples using the LIBS method for a total of 40 spectra. While the Raman data allowed for differentiating inkjet inks from different sources, the LIBS method resulted to be ineffective due to the strong paper signal that masked the emission lines attributable to the ink elemental profile. The Raman spectra could be individualized or divided into smaller groups. The use of all three colors from each sample produced spectra which discriminated all but two of the eight ink samples from each other.

Funding: NASA

105. Alterations in Neuronal Stem Cell Proliferation and Survival from Alcohol and Drugs of Abuse.

Megan Boone (Upshur County, West Virginia) and James Gainer (Randolf County, West Virginia)

Institution: West Virginia Wesleyan College

Field: Chemistry

Faculty advisor: Bruce Anthony

Alcoholism and drug abuse have become a growing concern in western cultures. Recent reports from the Center for Disease Control (CDC) suggest 16.6 million adults have Alcohol use Disorders (AUD). One-third of automobile fatalities are linked to alcohol use (10,076 deaths) and 88,000 people die from alcohol-related causes annually, making it the third leading preventable cause of death. From 2001 to 2013 there was a 2.5-fold increase in the total number of deaths associated with prescription drug use and in 2013, an estimated 24.6 million Americans 12 years old or older had used an illicit drug in the past month. More than 50% of the US population over the age of 26 uses illicit drugs (2014). The overall cost of alcohol, and illicit drugs use has exceeded \$700 billion dollars annually. Previous studies, using Fetal Alcohol Spectrum Disorders (FASD) as a model, have established alcohol-induced alterations in proliferation, differentiation and migration of neuronal stem/progenitor cells that contribute to abnormal phenotypes. Evidence suggests that alcohol reduces proliferation and increases cell loss in fetal neural crest stem cells as early as late first trimester. These changes ultimately effect the development of neural tube, heart valves, limbs, lower/upper jaw, and cranio-facial morphology. In addition, adults diagnosed with alcoholism/drug abuse show similar alterations in neuronal stem cell populations that originated from neural crest cells. This suggests that alterations in proliferation and cell losses contribute to altered brain function, neural plasticity and treatment recovery processes in addiction/recovery processes. We have shown that alcohol reduces proliferation and increases apoptosis in neuronal stem cells by a mis-regulation in cell cycle checkpoint controls impacting G1/S phase transitions in stem cells. These deregulated checkpoint controls likely alter mechanisms in the cell that monitor and control cell division, DNA replication, and apoptotic processes. We demonstrate altered expression of a key set of proteins that likely induces there stem cell changes. Our data suggests an alcohol-induced impact on neuronal stem cell proliferation and apoptosis, which alters cell cycle progression and protein expression at the G1/S phase checkpoint, effecting early S-phase DNA synthesis and inducing subsequent DNA damage. Understanding the mechanisms involved in altered proliferation of neuronal stem cells that contribute to both FASD and adult alcoholism brain phenotypes is necessary to improve both diagnostics and clinical intervention of FASD and to understand the needs of adults in substance abuse recovery programs.

Funding: WV-INBRE

106. Synthesis of a Chiral Nitrogen-based Rhodium Complex for Asymmetric Hydrogenation

Kelsie Krantz (Randolph County, West Virginia)

Institution: West Virginia Wesleyan College

Field: Chemistry

Faculty advisor: Joanna Webb

In the pharmaceutical industry, it is important to understand how chemical compounds interact with the body's biological receptors. Numerous chemical compounds that are used as drugs are chiral, meaning they have the same chemical formula but can arrange three dimensionally in two different configurations called enantiomers. Often in the medical field, one enantiomer can be beneficial while the other can have minimal or sometimes deleterious effects on the body. When synthesizing new drugs, a mixture of both enantiomers, called a racemic mixture, is yielded and must be separated. This is often very time consuming and produces unnecessary waste. A more efficient way to synthesize one specific enantiomer is through catalysis. For example, asymmetric hydrogenation catalysis selectively adds two hydrogen atoms to one face of an olefin, a carbon-carbon double bond producing only one specific enantiomer. The design of catalysts to facilitate this reaction is of particular interest. Research to date has focused on transition metal catalysts bearing phosphine-based supporting ligands; thus, chiral nitrogen-based ligands provide an opportunity to investigate a relatively underexplored area of hydrogenation chemistry. This project focuses on the synthesis of a chiral rhodium complex bearing a previously reported C₁-symmetric bis(imino)pyridine ligand in order to investigate asymmetric hydrogenation reactivity with a simple prochiral olefin substrate.

Funding: West Virginia Wesleyan College

107. Gas Well Impacts On Water

Emma Malcomb (Upshur County, West Virginia)

Institution: West Virginia Wesleyan College

Field: Environmental Studies

Faculty advisor: Kim Bjorgo-Thorne

Natural gas is a valuable resource for West Virginia's economy and people. The requirements to build wells, however, have impacts on West Virginia's land and water resources. Building wells may lead to environmental degradation to the soil and our streams. With over 1,900 completed wells and over 1,700 permitted wells, we have to take the environmental dangers into consideration on a more serious level. The purpose of my study was to examine the water quality collected in the area of gas wells. I also determined the streams closest to each completed well. I wanted to focus on streams because the rivers and streams hold wildlife such as native trout that are required to have a healthy habitat to live. Environmental degradation to the soil can cause erosion, which can quickly ruin the stream's insect and fish populations. Hydraulic fracturing chemicals can also be leaked into the water source during drilling, which may create hazardous health issues for not only the wildlife, but for the humans who consume the water.

Funding: West Virginia Wesleyan College

108. Silver Nanoparticles on Carbon Nanotubes Present Synergistic Antimicrobial Properties against Infections

Paige Rutter (Fayette County, West Virginia)

Institution: West Virginia Wesleyan College

Field: Engineering

Faculty advisor: Bingyun Li

Resistance to antimicrobial agents by pathogenic bacteria is a major health problem impacting infection patients in West Virginia and worldwide; there are more than 700,000 hospital associated infections in the U.S. each year. In 2014, the Obama Administration announced the “White House National Strategy for Combating Antibiotic Resistant Bacteria.” Silver (Ag) has been demonstrated to be highly biocidal against a variety of microorganisms including antibiotic resistant bacteria. Unfortunately, Ag has limited antimicrobial applications besides its use in topical treatments due to its potential toxicity in human cells.

In this study, supported by the WV INBRE program, we piloted the synthesis of Ag nanoparticles on carbon nanotubes (AgNP-CNT). AgNP was selected because nano-sized particles may present Ag with enhanced bacterial membrane penetration and higher antimicrobial properties. CNT was chosen because of its high surface area, which allows immobilization of large quantities of Ag if needed, and unique electrical, chemical, mechanical and thermal stabilities as well as excellent biocompatibility. AgNP-CNT was synthesized using a fast and simple conventional chemical method; its physical properties were characterized using scanning electron microscopy. Its antimicrobial properties were examined against *Staphylococcus aureus* (*S. aureus*), the most commonly seen bacteria in U.S. hospital infections, and its toxicity toward human cells (i.e. osteoblasts) was assessed using a cell viability assay.

We successfully synthesized AgNPs with different sizes (ranging from 90 nm to 200 nm) and interesting shapes (e.g. nano-particles, nano-cubes and nano-snowflakes) on the surfaces of CNT. The immobilization of AgNP on CNT led to high AgNP utilization and the simple preparation method allowed easy tuning of the quantity of AgNP immobilized. Our results showed that AgNP-CNT was effective in killing bacteria (i.e. *S. aureus*) and, at the same time, had low toxicity toward human cells (i.e. osteoblasts). More importantly, we found that AgNP-CNT had *synergistic* effects not only in killing *S. aureus* but also in reducing its toxicity toward human cells (i.e. osteoblasts) compared to AgNP or CNT alone. In the future, the synergistic antimicrobial properties of AgNP-CNT will be further evaluated in animal models and its potential anticancer properties will also be examined.

Funding: WV-INBRE

109. Responses to Public Displays of Affection by Same- and Other-Sex Couples

Brittany Bennington (Ohio County, West Virginia)

Institution: Wheeling Jesuit University

Field: Psychology

Faculty advisor: Debra Hull

Our study was designed to investigate responses undergraduates have to male-male (MM), female-female (FF), and male-female (MF) public displays of affection ranging from common social behavior to overtly sexual behavior, in order to determine how individuals interpret the same behaviors when performed by different types of couples. Understanding these responses may help both same-sex and other-sex couples realize the impact of their behavior on others and discover the specific behaviors that may be more likely to lead to harassment and abuse. Exposure to same-sex expressions of social and affectionate behavior impacts individuals, regardless of their sexual orientations, particularly given the recent legalization of same-sex marriage in West Virginia and around the country. Participants were 191 undergraduates (113 women, 78 men). Each participant received one of three surveys in which the couple was described as MM, FF, or FM. In each couple condition, participants were prompted to imagine the couple engaging in a total of 18 public display-of-affection scenarios and rate their level of agreement about the behavior they were imagining on 9 items for each scenario. Interactions between scenarios and type of couple were analyzed for each rating using separate 18 (scenario) X 3 (type of couple) ANOVAs. Significant interactions were investigated using Newman-Keuls tests. Scenarios were seen as significantly more common for a FM couple than for a FF couple, which were more common than for a MM couple, $F(34, 3094) = 4.98, p < .001$; significantly more appropriate for FF and FM couples than for MM couples, $F(34, 3094) = 2.39, p < .001$; significantly more sexual for MM than either FM or FF couples, $F(34, 3094) = 1.69, p = .008$; significantly less R-rated for MM and FM than for FF couples, $F(34, 3094) = 1.44, p = .047$; and significantly more likely to involve a couple for FM and MM pairs than for FF pairs, $F(34, 3094) = 2.89, p < .001$. Given the number of analyses that were conducted, our results suggest that there may not be a lot of negative response to public displays of affection by MM and FF couples, at least on a college campus. In addition, the commonness rating is not so much a value judgment as a statement of factual likelihood. In the future, we would like to measure responses to public displays of affection in other demographic groups and devise a means for measuring actual rather than imagined response.

110. Effects of Congruent vs. Incongruent Product Scent Administration on Online Purchasing Behavior

Mariah Cottrill (Pleasants County, West Virginia),

Institution: Wheeling Jesuit University

Field: Psychology

Faculty advisor: Bryan Raudenbush

The present study was conducted to investigate whether the administration of a congruent scent during an online shopping session influenced participants' product ratings and purchasing behavior. Participants rated ten on-line products, with the scent of the product administered during testing for three of these products (coffee, leather jacket, and fruity cereal). Consistent trends were noted such that congruent scent administration increased quality ratings and the amount participants were willing to pay for these products. Further, if the product was related to the scent being administered (such as coffee with breakfast foods or sneakers with leather), the participants also rated those products as having a higher quality and cost. Given the continuing increase in online shopping, the administration of congruent product scents could further bolster ratings of product quality and revenue. Future research should examine actual purchasing behaviors in-store vs. online during congruent scent administration.

Funding: Wheeling Jesuit University

111. INTERACTIVE EFFECTS OF PTC SENSITIVITY, PAPILLAE DENSITY, FOOD NEOPHOBIA, AND FOOD CHOICE

Jessica Pontis (Pennsylvania), Megan Randolph (Ohio County, West Virginia)

Institution: Wheeling Jesuit University

Field: Psychology

Faculty advisor: Bryan Raudenbush

Past research has shown that a) the number of papillae an individual has influences food choice, b) PTC sensitivity is related to both food choice and the number of papillae, and c) the degree of food neophobia (the unwillingness to try new foods) influences diet. The present study assesses the interactive effects of all of these influences. Sixty-nine participants completed questionnaires related to their eating attitudes and behaviors. PTC sensitivity ratings were made, tongue papillae were counted, and participants chose a typical meal from among 70 foods in a mock cafeteria setting. A significant positive correlation between papillae count and PTC bitterness rating was found, $r=.65$, $p<.001$. Food neophobics were found to have a greater number of papillae than food neophilics or an average group, $F(2,69)=4.16$, $p=.02$. Food neophilics chose a larger meal weight ($M=671.37$ grams) than food neophobics ($M=432.97$ grams), $F(2,69)=3.36$, $p=.04$. Food neophobics chose a meal comprised of significantly fewer calories ($M=433.34$ calories) than the average group ($M=666.05$ calories), $F(2,69)=3.43$, $p=.04$. Food neophobics chose a meal comprised of significantly less protein ($M=24.44$ grams) than the average group ($M=24.44$ grams), $F(2,69)=3.66$, $p=.03$. Future research should examine such interactive effects on participant health status.

Funding: Wheeling Jesuit University

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