

2016

## 2016 Symposium Brochure

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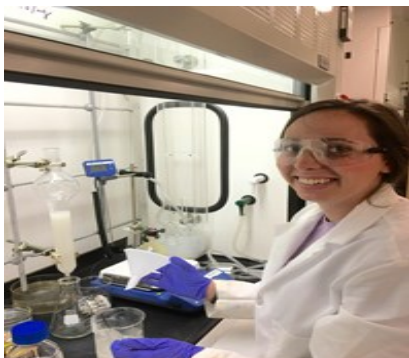
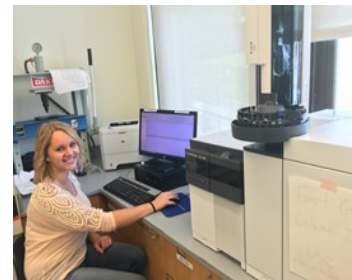
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# Summer Undergraduate Research Symposium

**Thursday, July 28, 2016**  
**Erickson Alumni Center**  
**West Virginia University**  
**Morgantown, WV**

[undergraduateresearch.wvu.edu/honors.wvu.edu/nanosafe.wvu.edu](http://undergraduateresearch.wvu.edu/honors.wvu.edu/nanosafe.wvu.edu)



**Building the Future of West  
Virginia, One Idea at a Time**

*Summer Undergraduate Research Symposium 2016  
West Virginia University*

Thursday July 28, 2016  
Erickson Alumni Center, Ruby Grand Hall

## I. Approximate Schedule of Events

8:30-8:55 am	<u>Poster Setup</u> — <i>Presenters arrive, register, and put up posters. Presenters must leave Alumni Center by 8:55 am and return during assigned, judged presentation time.</i>
9:00-11:30 am	<u>Poster judging</u> — <i>Only scheduled presenters &amp; not open to public (all presenters return at 11:30 am).</i>
11:30 am-12:00 pm	<u>Break/Lunch</u> — <i>Judges and presenters first priority, please.</i>
12:00-12:30 pm	<u>Welcome and Key Note Speaker</u> — <i>All welcome: parents, research advisers, graduate students, undergraduate participants, and general public.</i> <ul style="list-style-type: none"> <li>• <i>Welcome: Dr. Michelle Richards-Babb, Associate Professor &amp; Director of the Office of Undergraduate Research, WVU</i></li> <li>• <i>Introductory Remarks: Dr. Ken Blemings, Professor &amp; Dean of the Honors College, WVU</i></li> <li>• <i>Key Note Speaker: Provost Joyce McConnell, West Virginia University</i></li> </ul>
12:30-2:30 pm	<u>Poster Presentations</u> — <i>Open to all and concurrent with final poster judging. <b>Judges have preference!</b></i>
2:30-3:00 pm	<u>Awards Ceremony and Closing Remarks</u>
3:00 pm	<u>Poster Take-Down</u> — <i>Any posters remaining after 3:30 pm will be removed by the staff.</i>
3:05 pm	<i>Post-questionnaires (REU &amp; SURE participants)</i>

## II. Poster Judges

<b>Judge</b>	<b>Affiliation</b>	<b>Category Judging</b>
Tim Phipps	Agric. & Res. Economics, Davis College, WVU	<i>Agricultural &amp; Environmental Sciences</i>
Stephanie Young	Biology, Eberly College, WVU	<i>Biological Sciences</i>
Jennifer Franko	Microbiology, HSC, WVU	<i>Biological Sciences</i>
Reem Eldawud	Chemical Eng., Statler College, WVU	<i>Engineering</i>
Yu Gu	MAE, Statler College, WVU	<i>Engineering</i>
Mariette Barbier	Microbiology, HSC, WVU	<i>Health Sciences</i>
Alexandra Kadner	Neuroscience, HSC, WVU	<i>Health Sciences</i>
Aleksandr Stefaniak	Center for Disease Control/NIOSH	<i>Nanoscience</i>
Vincent Castranova	Pharmaceutical Sciences, School of Pharmacy, WVU	<i>Nanoscience</i>
Mark Tinsley	Chemistry, Eberly College, WVU	<i>Physical Sciences</i>
Alixandra Wagner	Chemical Eng., Statler College, WVU	<i>Physical Sciences</i>
Heather Henderson	Educational Psychology, CEHS, WVU	<i>Social Sciences &amp; non-STEM</i>

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

### III. Undergraduate Participants and Faculty Research Mentors

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

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Aleena Andrews	Physical Sci. #13 (10:30 am)	Chemistry	The College of New Jersey	Blake Mertz, Chemistry
Anne Belldina	Physical Sci. #1 (10:30 am)	Chemistry & Philosophy	WV Wesleyan	Carsten Milsmann, Chemistry
Caitlin Embly	Physical Sci. #4 (9:30 am)	Chemistry	Northern Virginia Comm. C.	Jessica Hoover, Chemistry
Kathryn Kapp	Biological Sci. #3 (10:30 am)	Chemistry	Gannon U.	Justin Legleiter, Chemistry
Kayla Kroner	Physical Sci. #9 (10:30 am)	Chemistry	Drake U.	Brian Popp, Chemistry
Barry Liang	Biological Sci. #4 (9:50 am)	Biochemistry	St. Mary's College of MD	Justin Legleiter, Chemistry
Derik McCarthy	Health Sci. #5 (10:30 am)	Chemistry	County College of Morris	Suzanne Bell, Chemistry
Jeffrey McNeill	Physical Sci. #11 (10:30 am)	Biochemistry	WV Wesleyan	Björn Söderberg, Chemistry
Paul Orndorff	Physical Sci. #10 (9:30 am)	Chemistry	York College of PA	Fabien Goulay, Chemistry
Sierra Stinson	Physical Sci. #12 (9:30 am)	Chemistry	Saint Francis U.	Glen Jackson, Chemistry

***B. NanoSAFE Research Experiences for Undergraduates (REU) Site: Multifunctional Nanomaterials (PI: Lisa Holland; co-PI: Kim Quedado; Assistant to Director: Rachel Henderson)***

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Jenny Bundy	Nanoscience #6 (9:50 am)	Biology	WV Wesleyan	Linda Sargent, NIOSH
Dakota Burdette	Nanoscience #9 (10:30 am)	Biochemistry	WV Wesleyan	Kung Wang, Chemistry
Rainor Connor	Nanoscience #1 (10:30 am)	Physics	Salisbury U.	Mikel Holcomb, Physics
Kathrine Curtin	Nanoscience #3 (10:30 am)	Chemistry	Saint Vincent C.	Nick Wu, MAE
Rebecca Davis	Nanoscience #4 (9:50 am)	Applied Physics	WV Wesleyan C.	David Lederman & Pavel Borisov, Physics
Shannon Patberg	Nanoscience #7 (10:30 am)	Biochemistry	Marietta C.	Lisa Holland, Chemistry
Vincent Pilolli	Nanoscience #8 (9:50 am)	Biology	Youngstown State	Jen Gallagher, Biology
Annika Schroder	Nanoscience #2 (9:50 am)	Chemistry	Gustavus Adolphus C.	Lisa Holland, Chemistry
Kylie Shockley	Nanoscience #10 (9:50 am)	Biochemistry	WV Wesleyan C.	Steve Leonard, NIOSH

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<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Jordan Sosa	Nanoscience #11 (10:30 am)	Engineering & Physics	U. of Tulsa	Cheng Cen, Physics
Megan Wilt	Nanoscience #12 (9:50 am)	Chemistry	John Carroll U.	Xueyan Song, MAE
McKenzie Windham	Nanoscience #13 (10:30 am)	Biological Eng.	Louisiana State U.	Jeremy Dawson, EE

***C. STEM Summer Undergraduate Research Experiences (SURE) Site (Coordinator/Director: Michelle Richards-Babb; Assistant to Director: Kacee Caster)***

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
<sup>b</sup> Garima Agarwal	Biological Sci. #12 (9:50 am)	Biochemistry	WVU	Justin Legleiter, Chemistry
Kensey Bergdorf	Health Sci. #13 (10:30 am)	Immunology & Medical Microbiology	WVU	John Barnett, Microbiology
Dustin Bragg	Engineering #17 (10:30 am)	Chemical Engineering	WVU	Ed Sabolsky, MAE
Nathan Burks	Social/Non-STEM #2 (9:50 am)	Finance & Economics	WVU	Ann Marie Hibbert, Finance
Adam Chivers	Health Sci. #18 (9:30 am)	Biomedical Eng.	WVU	Sergiy Yakovenko, Human Performance
Lucas Darnell	Engineering #7 (10:30 am)	Computer Sci.	WVU Tech	Katerina Goseva- Popstojanova, Computer Sci & EE
Cristin Dolan	Biological Sci. #10 (9:50 am)	Chemical Engineering	WVU	Cerasela-Zoica Dinu, Chemical & Biomed. Eng.
Margaret Drazba	Health Sci. #8 (9:30 am)	Human Nut. & Foods	WVU	Melissa Marra, Human Nut. & Foods
Matthew Epperly	Health Sci. #1 (10:30 am)	Immunology & Medical Microbiology	WVU	Fredrick Damron, Microbiology
Timothy Ferrebee	Health Sci. #16 (9:30 am)	Biochemistry	WVU	Justin Legleiter, Chemistry
<sup>a</sup> Elliot Guerra- Blackmer	Biological Sci. #11 (10:30 am)	Biochemistry & Applied & Env. Microbiology	WVU	Teiya Kijimoto, Plant & Soil Science
Elizabeth Janeiro	Social/Non-STEM #1 (10:30 am)	Sport & Exercise Psychology	WVU	Dana Voelker, Sport & Exercise Psychology
Jaya Karlapati	Engineering #4 (9:30 am)	Mechanical & Aerospace Eng.	WVU	Patrick Browning, MAE
<sup>a</sup> Laura Kelley	Physical Sci. #5 (10:30 am)	Biometric Systems & EE	WVU	Alan Bristow, Physics
Sundus Lateef	Health Sci. #12 (9:30 am)	Chemistry & Biology	WVU	Janet Tou, Animal & Nut. Sci.
James Leonard	Agric. & Env. Sci. #6 (9:30 am)	Agroecology	WVU	James Thompson, Plant & Soil Science



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<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Rachel McDonald	Social/Non-STEM #6 (9:50 am)	Psychology	WVU	Natalie Shook, Psychology
William Moon	Engineering #5 (10:30 am)	Mechanical & Aerospace Eng.	WVU	John Kuhlman, MAE
Keegan Mueller	Engineering #10 (9:30 am)	Mechanical & Aerospace Eng.	WVU	Jason Gross, MAE
Alexandra Mullins	Social/Non-STEM #3 (10:30 am)	Sociology & Women's & Gender Stud.	WVU	Travis Stimeling, Music History
Luke Neal	Biological Sci. #9 (10:30 am)	Physics	WVU	Earl Scime, Physics
<sup>b</sup> Margaret Neely	Engineering #15 (10:30 am)	Biomedical Eng.	WVU	Cerasela-Zoica Dinu, Chemical & Biomed. Eng.
Frank Notarnicola	Engineering #13 (10:30 am)	Mechanical & Aerosp. Eng.	WVU	John Christian, MAE
<sup>a</sup> Catherine O'Hearn	Engineering #12 (9:30 am)	Electrical Eng.	WVU	Jeremy Dawson, EE
Anika Rowe	Physical Sci. #7 (10:30 am)	Chemistry	WVU	Maura McLaughlin, Physics
Olivia Santee	Engineering #8 (9:30 am)	Mechanical Eng.	WVU	James Smith, MAE
Hunter Snoderly	Health Sci. #17 (10:30 am)	Biomedical Eng.	WVU	Ming Pei, Orthopedics
Rachel Tallman	Health Sci. #6 (9:30 am)	Biology	WVU	Paul Lockman, Pharmaceutical Sci.
Conrad Trump	Social/Non-STEM #7 (10:30 am)	Communication Studies & World Languages	WVU	Keith Weber, Communication Studies
Emma Veshecco	Social/Non-STEM #5 (10:30 am)	Psychology	WVU	Cheryl McNeil, Psychology
<sup>b</sup> Gabriel Walkup	Physical Sci. #8 (9:30 am)	Chemistry	WVU	Glen Jackson, Chemistry & Forensics
Tyler Wanstreet	Health Sci. #11 (10:30 am)	Biology	WVU	Rajesh Naz, Microbiology, Immunology and Cell Biology

<sup>a</sup>Supported by an NSF Louis Stokes Alliance for Minority Participation (LSAMP) KY-WV Mid-Level Alliance Phase II (LSAMP-1305039) with partial funding through SURE (WV PI: David Miller).

<sup>b</sup>Supported with grant funding provided by the faculty member.

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***D. WVU Honors administered Summer Undergraduate Research Experiences (SURE) Site (PI: Ken Blemings; Assistant to Director: Ben Harrison)***

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Stephanie Arnold	Agric. & Env. Sci. #8 (9:30 am)	Biochemistry	WVU	Daniel Panaccione, Plant & Soil Sciences
Alexander Battin	Health Sci. #19 (10:30 am)	Biochemistry	WVU	Stanley Zaslau, Urology
Nina Bidwai	Health Sci. #4 (9:30 am)	Biology	WVU	Gordon Meares, Microbiology, Immunology & Cell Biology
Audrey Biega	Biological Sci. #13 (10:30 am)	Biology	WVU	Jennifer Gallagher, Biology
David-Michael Buckman	Engineering #11 (10:30 am)	Computer Sci. & Eng.	WVU	Powsiri Klinkhachorn, Computer Sci. & EE
<sup>a</sup> Torli Bush	Engineering #9 (10:30 am)	Mechanical Eng.	WVU	V'yacheslav Akkerman, MAE
Emily Bushman	Agric. & Env. Sci. #7 (10:30 am)	Geology & English	WVU	Amy Hessel, Geography
Domenic Cipollone	Engineering #1 (10:30 am)	Mechanical Eng.	WVU	Kostas Sierros, MAE
Mary Clapham	Agric. & Env. Sci. #3 (10:30 am)	Animal & Nutritional Sci.	WVU	Joseph McFadden, Biochemistry & Dairy Sci.
Mary Coleman	Agric. & Env. Sci. #2 (9:30 am)	Animal & Nutritional Sci.	WVU	Joseph McFadden, Biochemistry & Dairy Sci.
Christine Doepker	Biological Sci. #6 (9:50 am)	Biology	WVU	Timothy Driscoll, Biology
Marissa Frazie	Agric. & Env. Sci. #4 (9:30 am)	Animal & Nutritional Sci.	WVU	Kang Mo Ku, Horticulture
Abby Harold	Health Sci. #2 (9:30 am)	Immunology & Medical Microbiology	WVU	Ivan Martinez, Microbiology, Immunology & Cell Biology
Erica Haught	Biological Sci. #8 (9:50 am)	Biology	WVU	Kevin Daly, Biology
Kathryn Hinkelman	Physical Sci. #2 (9:30 am)	Chemistry	WVU	Fabien Goulay, Chemistry
Natalie Hobeika	Biological Sci. #2 (9:50 am)	Biochemistry	WVU	Shuo Wei, Biology
<sup>a</sup> Whitney Horton	Health Sci. #10 (9:30 am)	Biology & Psychology	WVU	Linda Nield, Medical Education & Pediatrics
Melanie Hott	Nanoscience #5 (10:30 am)	Biomedical Eng.	WVU	Cerasela-Zoica Dinu, Chemical & Biomedical Eng.
<sup>a</sup> Zachary Kilwein	Engineering #14 (9:30 am)	Chemical Eng. & Spanish	WVU	Fernando Lima, Chemical Eng.
<sup>a</sup> Keenan Kocan	Engineering #6 (9:30 am)	Mechanical & Aerospace Eng.	WVU	David Mebane, MAE
Dylan Leary	Physical Sci. #6 (9:30 am)	Chemistry	WVU	Carsten Milsmann, Chemistry
Caitlin Morrow	Physical Sci. #14 (9:30 am)	Chemical Eng.	WVU	Blake Mertz, Chemistry

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<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Paige Palumbo	Biological Sci. #7 (10:30 am)	Biology	WVU	Nik Kovich, Plant Genetics
Taryn Pifer	Agric. & Env. Sci. #5 (10:30 am)	Environmental Geoscience	WVU	Brenden McNeil, Geography
Amos Powell	Engineering #3 (10:30 am)	Mechanical & Aerospace Eng.	WVU	Patrick Browning, MAE
Erika Ridgway	Agric. & Env. Sci. #1 (10:30 am)	Microbiology	WVU	Kang Mo Ku, Horticulture
Zachary Short	Physical Sci. #16 (9:30 am)	Physics & Mathematics	WVU	Earl Scime, Physics
Joseph Stein	Physical Sci. #3 (10:30 am)	Chemistry & Forensic and Investigative Sci.	WVU	Suzanne Bell, Chemistry
James Turner	Engineering #16 (9:30 am)	Mechanical Eng.	WVU	Nianqiang Wu, MAE

<sup>a</sup>Supported by an NSF Louis Stokes Alliance for Minority Participation (LSAMP) KY-WV Mid-Level Alliance Phase II (LSAMP-1305039) with partial funding through SURE (WV PI: David Miller).

***E. WVU Cancer Institute Summer Research Fellowship Program (Coordinator: Alexey Ivanov) & Center for Neuroscience Summer Undergraduate Research Internships (SURI) (Director: George A. Spirou; Coordinator: Erica Stewart)***

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
Cassidy Bland	Health Sci. #14 (9:30 am)	Biomedical Eng.	WVU	David Klinke, Chemical & Biomedical Eng.
Eric Lundstrom	Health Sci. #7 (10:30 am)	Biology	WVU	Linda Vona-Davis, Surgery
Joseph McGuire	Health Sci. #15 (10:30 am)	Biology	WVU	Alexey Ivanov, Biochemistry
Patricia Doyle	Biological Sci. #1 (10:30 am)	Biology	WVU	Werner Geldenhuys, Pharmaceutical Sci.
Pooja Warriar	Health Sci. #3 (10:30 am)	Biomedical Eng.	WVU	Candice Brown, Neurobiology & Anatomy



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***F. Faculty Supported or Self-Supported***

<b>Participant</b>	<b>Poster (Judged Time)</b>	<b>Major</b>	<b>Home School</b>	<b>Faculty Advisor</b>
<sup>a</sup> Zach Bonham	Social/Non-STEM #4 (9:50 am)	Chemistry & Biochemistry	WVU	Jessica Hoover (Chemistry), Jason Lee (Sculpture) & Todd Hamrick (Engineering)
Austin Clark	Physical Sci. #15 (10:30 am)	Chemistry	WVU	Blake Mertz, Chemistry
<sup>a</sup> Philip Evans	Social/Non-STEM #4 (9:50 am)	Engineering	WVU	Jessica Hoover (Chemistry), Jason Lee (Sculpture) & Todd Hamrick (Engineering)
Soofia Lateef	Engineering #2 (9:30 am)	Chemical Eng.	WVU	Cerasela-Zoica Dinu, Chemical & Biomed. Eng.
Oliver Lin	Health Sci. #9 (10:30 am)	Biomedical Eng.	WVU	Gloria Oporto, Wood Sci. & Jacek Jaczynski, Human Nut. & Foods
<sup>b</sup> Sarah Peterson	Biological Sci. #5 (10:30 am)	Biology	WVU	Sadie Bergeron, Biology

<sup>a</sup>Supported by an NSF CAREER award (PI: Jessica Hoover) to take part in the Community Engagement in Science Through Art (CESTA) program.

<sup>b</sup>Research support from the Henry W. Hurlbutt Memorial Fund from the Department of Biology.

#### **IV. Speakers at REU/SURE Events**

<b><u>Speaker</u></b>	<b><u>Affiliation</u></b>	<b><u>Group(s)</u></b>	<b><u>Topic</u></b>
Barbara Foster	Dept. of Chemistry, WVU	REU & SURE	Laboratory Safety
Ali Elliott	Biosafety Officer Health Sciences Center	REU & SURE	Biosafety Training
Graduate Students	Various WVU Depts.	REU & SURE	Peer Advice, Networking
Graduate Coordinators	Various WVU Depts. & Colleges	REU & SURE	Graduate School & Recruitment
Natalie Shook	Psychology, WVU	REU & SURE	Diversity Awareness & Implicit Bias
Michelle Richards-Babb	Chemistry & Office of, UG Research, WVU	REU & SURE	Oral Present. Skills/Lab Notebks, Ethics, Responsible Conduct of Research, Poster Preparation
Hellen Nditsi	Office of UG Research, WVU	SURE	Get to Know Bingo & Photos
Heather Henderson & Paul Hernandez	Education, WVU	REU & SURE	Mentor Training
Linda Blake	Wise Library, WVU	REU & SURE	Library Research Search Tools

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Amy Cyphert & Cate Johnson	ASPIRE Office, WVU	SURE	Prestigious Scholarships
<b><u>Speaker</u></b>	<b><u>Affiliation</u></b>	<b><u>Group(s)</u></b>	<b><u>Topic</u></b>
Toni Jones & Jesse Barclay	Career Services, WVU	SURE	Cover letters, Resumes, & Elevator speech; Resume feedback
Shelly Stump	WVU Office of Graduate Admissions & Recruiting	REU & SURE	Ice Cream Social & Graduate Recruitment Networking Event
Brian Popp	Chemistry, WVU	REU & SURE	ChemDraw Training & NMR Intro
Justin Legleiter	Chemistry, WVU	REU & SURE	Graduate Recruitment & Surface Imaging Intro
Jeff Petersen	Chemistry, WVU	REU	Crystallography Intro
Nelson Rekos	NETL	REU, SURE, CESTA	Career Mentoring: Government
Todd Hamrick	Engineering, WVU	REU & SURE	Career Mentoring: Academia
Sae-Mi Lee	CPASS	REU & SURE	The Art of Research Writing
Stephen Valentine	Chemistry, WVU	REU & SURE	Entrepreneurship & Mass Spec Intro
Mary Sue Martin	SciEX	REU & SURE	Career Mentoring: Industry
Kevin Howard	Dow Chemical & K4M Consulting	REU & SURE	Career Mentoring: Industry
Callee Walsh	Protea Biosciences	REU & SURE	Career Mentoring: Industry
Kas Kasten	HSTA Coordinator	SURE	UG Research Mentoring
Kim Quedado	IGERT Project Manag.	REU & SURE	Morgantown Kids Day: Hands on Science
Ryan Claycomb, Katie Stores, Sue Day-Perroots, Janet Tou, David Klinke, & Crys Povenski	WVU Faculty, Staff, Dean, & Assoc. Provost	REU & SURE	Inside Academia Workshop

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

## V. Websites

### *Need more information?*

Chemistry REU: <http://undergraduateresearch.wvu.edu/reu-site-research-in-chemistry-at-wvu>

Nano REU: <http://nanosafe.wvu.edu/education/undergraduate-programs/reu>

STEM SURE & WVU Honors administered SURE:

<http://undergraduateresearch.wvu.edu/summer-undergraduate-research-experience>

Community Engagement in Science Through Art (CESTA): <http://www.cestaprogram.com/>

WVU Cancer Institute Summer Research Fellowship Program:

<http://wvucancer.org/education/undergraduate/>

WVU Center for Neuroscience SURI: <http://www.hsc.wvu.edu/wvucn/training-programs/suri/>

Office of Undergraduate Research: <http://undergraduateresearch.wvu.edu/>

NanoSAFE: <http://nanosafe.wvu.edu/>



## Acknowledgements

### A. Personnel

#### Chemistry REU

Michelle Richards-Babb, PI

Brian Popp, co-PI

Rachael Pickens, Asst. to REU Director

#### STEM SURE

Michelle Richards-Babb, Director/Educ. Coord.

Kacee Caster, Asst. to SURE Director & TA

Hellen Nditsi, Office of UG Research, Coord.

With help from the Eberly College of Arts and Sciences Business Office

#### WVU Honors administered SURE

Ken Blemings, PI & Director

Ben Harrison, Asst. to SURE Director & TA

#### Nano REU

Lisa Holland, PI

Kim Quedado, co-PI

Rachel Henderson, Asst. to REU Director

#### Symposium Booklet

Michelle Richards-Babb

Kacee Caster

Rachael Pickens

Hellen Nditsi

Becky Secrist

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**B. Financial Support**

1. **Chemistry REU (PI: Michelle Richards-Babb, co-PI: Brian Popp)**  
National Science Foundation (NSF) Division of Chemistry (CHE 1559654) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.
2. **Nano REU (PI: Lisa Holland, co-PI: Kim Quedado)**  
National Science Foundation (NSF) Divisions of Materials Research and Chemistry (DMR 1559880) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.
3. **STEM SURE (Director: Michelle Richards-Babb)**  
Sponsored and funded by the WVU Office of the Provost with partial funding from the WVU Eberly College of Arts and Sciences, the Statler College of Engineering and Mineral Resources, the Davis College of Agriculture, Natural Resources, and Design, the Health Sciences Center and the Colleges of Creative Arts and Physical Activity and Sports Sciences and the Department of Immunology and Medical Microbiology.
4. **WVU Honors administered SURE (PI: Ken Blemings)**  
Sponsored in part by the West Virginia Research Challenge Fund through a grant from the Division of Science and Research, HEPC, WVU, Davis College of Agriculture, Forestry and Consumer Sciences, Eberly College of Arts and Sciences, the Statler College of Engineering and Mineral Resources, the School of Medicine, and The Honors College.
5. **WVU Cancer Inst. Summer Research Fellowship Program (Coord: Alexey Ivanov)**  
Financial support for the fellowship program comes from the Edwin C. Spurlock Fellowship Fund, the Edward L. Reed Cancer Research Endowment, the Dr. David B. McClung Cancer Research Endowment Fund, and the Joe Marconi Cancer Research Fellowship Endowment.
6. **WVU Center for Neuroscience SURI (Director: George A. Spirou, Program Coordinator: Erica Stewart)**  
Funded by the Center for Neuroscience and the NIH/NIGMS CoBRE Grant 8P30GM103503.
7. **LSAMP KY-WV Mid-Level Alliance (Co-PI: David Miller)**  
Stipends and tuition for seven SURE participants were funded through the NSF Louis Stokes Alliance for Minority Participation (LSAMP) KY-WV Mid-Level Alliance Phase II (LSAMP-1305039).



## Agricultural & Environmental Sciences Category

### Ag & Env Sci Category Index:

**Poster 1:** *Antimicrobial activity of glucosinolates hydrolysis products of Brassica crops.*

**Erika L. Ridgway**, Marissa D. Frazie, Moo Jung Kim, Yu-Chun Chiu & Kang-Mo Ku.

**Poster 2:** *Quantifying energy sources of the peripartal dairy cow using ultrasonic evaluation of backfat.* **Mary J. Coleman**, Amanda N. Davis, J. Eduardo Rico, Zachary C. Phillips & Joseph W. McFadden.

**Poster 3:** *The evaluation of insulin sensitivity in dairy cows transitioning from gestation to lactation.* **Mary E. Clapham**, Amanda N. Davis, J. Eduardo Rico, Zachary C. Phillips & Joseph W. McFadden.

**Poster 4:** *Genetic and maturity effects on phytochemical concentrations of various Brassica juncea cultivars.* **Marissa D. Frazie**, Erika L. Ridgway, Moo Jung Kim, Yu-Chun Chiu & Kang-Mo Ku.

**Poster 5:** *Analysis of tree phenology variation based on differences in aspect and elevation.*  
**Taryn Pifer**, Brenden McNeil & Henry Lieberman.

**Poster 6:** *Do rock-eating fungi inhabit high elevation red spruce ecosystems in West Virginia?*  
**James E. Leonard**, Travis W. Nauman, Kathleen Benison & James A. Thompson.

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## **Agricultural & Environmental Sciences Category**

### **Ag & Env Sci Poster 1:**

#### **Antimicrobial activity of glucosinolates hydrolysis products of *Brassica* crops**

Erika L. Ridgway<sup>1</sup>, Marissa D. Frazie<sup>2</sup>, Moo Jung Kim<sup>1</sup>, Yu-Chun Chiu<sup>1</sup>, and Kang-Mo Ku<sup>1</sup>

<sup>1</sup>*Division of Plant and Soil Science,* <sup>2</sup>*Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26505*

Glucosinolates (GS) are sulfur containing secondary metabolites, mainly found in *Brassica* crops. The hydrolysis products of GS including allyl-, benzyl-, and phenylethyl isothiocyanate have shown antimicrobial activity against foodborne pathogens. The objective of this research is to determine antimicrobial effects of by-products and edible tissue from various *Brassica* crops. Aqueous extracts of leaves and roots of horseradish and kale, and leaves of broccoli and watercress were applied to the two *Salmonella* strains (*Salmonella Tennessee* and *Salmonella Trypsy*) after two hours of hydrolysis and compared with the extracts of tomato and lettuce leaves. Bacterial growth was measured using a plate reader. Horseradish root showed the greatest inhibition at 29.75%, indicating antimicrobial activity of allyl isothiocyanate. However, the nutrients from plant extracts may have negative effect on antimicrobial properties of isothiocyanates. The interaction between plant extracts and incubation temperature will be measured and discussed. The result of this study would help utilization of by-products of agricultural crops or edible products as an antimicrobial agent to reduce foodborne pathogen outbreak.

### **Ag & Env Sci Poster 2:**

#### **Quantifying energy reserves of the peripartal dairy cow using ultrasonic evaluation of backfat thickness**

Mary J. Coleman, Amanda N. Davis, J. Eduardo Rico, Zachary C. Phipps, and Joseph W. McFadden

*Davis College of Agriculture, Natural Resources and Design, Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26505*

The dairy cow transitioning from gestation to lactation experiences appetite suppression and increased energy demands due high milk production. The resulting negative energy balance makes assessment of body condition essential to maintaining herd health. Body Condition Scoring (BCS) is the standard method for evaluating adiposity in dairy cows, but due to inherent subjectivity, inaccuracy is an issue with this technique. The use of ultrasound to measure subcutaneous fat in the sacral region has the potential to be a more quantitative method to assess condition in dairy cows. To investigate the efficacy of measuring Backfat Thickness (BFT), eighteen peripartal Holstein cows were ultrasounded weekly from -28 days to +28 days relative to parturition. BCS scores were recorded and serum non-esterified fatty acid (NEFA) concentrations were measured. Results indicate a correlation between BFT and BCS, suggesting that BFT is more sensitive to adipose loss, especially in over-conditioned cows. The use of ultrasound to evaluate energy reserves can potentially assist producers with maintaining peripartal cows and act as an indicator of potential metabolic diseases (i.e. ketosis, fatty liver).



## **Agricultural & Environmental Sciences Category**

### **Ag & Env Sci Poster 3:**

#### **The evaluation of insulin sensitivity in dairy cows transitioning from gestation to lactation**

Mary E. Clapham, Amanda N. Davis, J. Eduardo Rico, Zachary C. Phipps, and Joseph W. McFadden

*Davis College of Agriculture, Natural Resources, and Design, Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26505*

Dairy cows experience negative energy balance during the transition from gestation to lactation due to appetite suppression and increased milk production. As a means to partition glucose to the mammary gland, the dairy cow develops insulin resistance, a response that is associated with enhanced lipolysis. In turn, postpartum metabolic diseases develop, such as ketosis, fatty liver, displaced abomasum, etc. Overweight cows may develop greater insulin resistance, relative to lean cows. Therefore, our objective was to evaluate insulin action in lean and overweight cows. Twenty multiparous Holstein cows (10 lean and 10 overweight) were evaluated -28 to +28 d, relative to calving. This study evaluated changes in circulation glucose, insulin, and non-esterified fatty acid (NEFA) concentrations during the periparturient period. Changes in intake, milk production, and adipose were also evaluated. Furthermore, we performed the hyperinsulinemic-euglycemic clamp (HEC) method to assess insulin sensitivity. Our study will provide us with an improved understanding of periparturient metabolism.

### **Ag & Env Sci Poster 4:**

#### **Genetic and maturity effects on phytochemical concentrations of various *Brassica juncea* cultivars**

Marissa D. Frazie<sup>1</sup>, Erika L. Ridgway<sup>2</sup>, Moo Jung Kim<sup>2</sup>, Yu-Chun Chiu<sup>2</sup>, and Kang-Mo Ku<sup>2</sup>

*<sup>1</sup>Division of Animal and Nutritional Sciences, <sup>2</sup>Division of Plant and Soil Science, West Virginia University, Morgantown, WV 26505*

Indian Mustard (*Brassica juncea*) includes several genetically diverse and nutritional subspecies that can be harvested for their seeds and leaves. Although mustard seeds are most commonly used as a condiment, mustard leaves can also be consumed as mustard greens. Mustard greens containing high concentrations of glucosinolates, antioxidants, or other phytochemicals are often associated with their ability to prevent certain chronic diseases, including cancer, diabetes, and cardiovascular disease. Particular mustard cultivars containing antioxidants, including anthocyanins, exhibit red pigmentation throughout the leaves. For this experiment, eleven cultivars of *Brassica juncea* with varying coloration were selected. Young (19 days of growth) and mature (35 days of growth) crops were harvested. The chosen cultivars will be analyzed using ferric reducing ability of plasma (FRAP) assay and ultra-high pressure liquid chromatography (UHPLC) to determine glucosinolates, anthocyanins, and carotenoid concentrations. Ultimately, expected results aim to reveal which of the eleven mustard cultivars have the highest overall nutritional value, benefits for human health, and the correlation between phytochemical concentrations at different stages of maturity.

## Agricultural & Environmental Sciences Category

### Ag & Env Sci Poster 5:

#### **Analysis of tree phenology variation based on differences in aspect and elevation**

Taryn Pifer, Brenden McNeil<sup>1</sup>, and Henry Lieberman<sup>2</sup>

<sup>1</sup>*Department of Geology and Geography,* <sup>2</sup>*Davis College of Agriculture, Natural Resources, and Design, West Virginia University, Morgantown, WV, 26506*

Trees adapt to the environment in which they dwell through a variety of ways. Understanding optimal conditions for forests to thrive is necessary for identifying how alteration of forests may affect them. We hypothesized that variation in factors of aspect and elevation is directly related to tree height and speciation variability within a single forest. In this study, we divided the 7,600-acre research forest into five 20-acre plots that contain differences in aspect and elevation. We chose approximately twenty 1/10-acre subplots within each plot and carried out a tree-inventory-based field methodology to acquire data on tree height, diameter at breast height, and species, as well as subplot topographic details. At the conclusion of our fieldwork, we had obtained data on nearly 2,000 trees. Although about 30 species were recorded, our focus was geared toward more abundant species such as chestnut oak, red oak, red maple, and yellow poplar. We have begun a process of data extraction in order to analyze possible significant differences in trees through utilizing GIS and spreadsheet techniques.

### Ag & Env Sci Poster 6:

#### **Do rock-eating fungi inhabit high elevation red spruce ecosystems in West Virginia?**

James E. Leonard<sup>1</sup>, Travis W. Nauman<sup>2</sup>, Kathleen Benison<sup>3</sup>, and James A. Thompson<sup>1</sup>

<sup>1</sup>*Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV 26506,* <sup>2</sup>*USGS Canyonlands Research Station, Moab, UT 84532, and* <sup>3</sup>*Department of Geology and Geography, West Virginia University, Morgantown, WV 26506*

Ectomycorrhizal fungi (EcM) can actively tunnel into sand- and silt-sized mineral grains of feldspar, contributing to plant nutrient acquisition in a nutrient limited environment—and leaving behind distinctive micropores in the mineral grains. Studies show EcM tunneling in red spruce (*Picea rubens*) ecosystems within the United States. Trace fossils of past EcM tunneling may be useful as an indicator to better identify historic red spruce habitat and, therefore, potential restoration sites. We looked for the presence of EcM tunneling in high elevation soils of West Virginia. Samples were selected based off the presence of red spruce, as well as coniferous ecosystems reflective of locations in Vermont, where EcM tunneling have been confirmed. Soil samples were processed into thin sections for review under a petrographic microscope. West Virginia thin sections display both plagioclase and k-spar feldspar species, with intensively weathered quartz as the dominant mineral. Tunneled minerals are confirmed feldspar based off thin section staining of plagioclase and k-spar. EcM tunneling occurs in West Virginia, and may provide useful in helping guide red spruce restoration.

## Agricultural & Environmental Sciences Category

### Ag & Env Sci Poster 7:

#### Understanding change in tree ring growth over time without using methods of detrending

Emily C. Bushman and Amy Hessler

*Montane Forest Dynamics Laboratory, Department of Geology and Geography, West Virginia University, Morgantown, WV 26506*

Long records of past climate can help us place current changes in context. Long-lived trees from semi-arid locations can provide millennium long, annually dated records of past moisture availability, but it is unclear how well these records preserve low frequency information. Most tree ring analysis uses a method called detrending, which smooths out the different growth patterns of individual trees to better understand the big picture of tree behavior, but in turn may eliminate low frequency climate signals (>100 year frequency). In this study, we measured the tree rings in cross sections of fallen Siberian pines from the Khorgo Lava region of Mongolia and analyzed tree ring growth by averaging, without detrending. We aim to see if Khorgo Lava pines have had variable growth rates throughout at the centennial scale, dating back beyond 700 BCE. The results are still inconclusive, but they can potentially add to dendrochronology by presenting a whole new method of tree analysis.

### Ag & Env Sci Poster 8:

#### Biosynthesis of dihydroergot alkaloids by genetic modification of the fungus *Neosartorya fumigata*

Stephanie L Arnold<sup>1</sup> and Daniel G. Panaccione<sup>2</sup>

<sup>1</sup>*Department of Biochemistry and* <sup>2</sup>*Division of Plant and Soil Sciences, Davis College, West Virginia University, Morgantown, WV 26506*

Fungi have been used throughout the years to produce pharmaceutically important chemicals. Lysergic acid (LA) and dihydrolysergic acid (DHLLA) are structurally similar but have different activities related to cognitive function and other clinical applications. LA has been produced by genetic modification of the model fungus *Neosartorya fumigata*, but the biosynthetic pathway to DHLLA is unknown. Previous studies showed that the enzyme CloA from an LA-producing fungus oxidized the substrate agroclavine to LA. We transformed CloA from the LA-producing fungus into *N. fumigata*, but it failed to oxidize festuclavine (the dihydro form of agroclavine) to DHLLA; thus, in order to produce DHLLA a different version of CloA may be necessary. We hypothesized that CloA from *Claviceps africana*, a DHLLA-producing fungus, would oxidize festuclavine to DHLLA. *Claviceps africana* CloA was expressed in *N. fumigata* by attaching its coding sequences to an *N. fumigata*-specific promoter. HPLC and mass spectrometry analyses demonstrated that the transformed fungal colonies produced DHLLA. Substrate feeding studies indicated interesting differences in CloA specificity. Our results proved DHLLA can be produced by a bioengineering strategy.

## Biological Sciences Category

### Bio Sci Category Index:

**Poster 1:** *Effect of reactive oxygen species generators on mitoNEET expression in astrocytes and brain endothelial cells.* **Patricia H. Doyle**, Briah Gaasch, Rowaa Aljammal, Wei Wang, Sujung Jun, Candice M. Brown & Werner J. Geldenhuys.

**Poster 2:** *Expression of ADAM9 and canonical Wnt signaling components in human colorectal cancer tissues.* **Natalie Hobeika**, Mark Perfetto & Shuo Wei.

**Poster 3:** *Optimizing a small peptide's ability to inhibit huntingtin aggregation in lipid membranes.* **Kathryn L. Kapp** & Justin Legleiter.

**Poster 4:** *Determining chemical interaction between small-molecule aggregation inhibitors and huntingtin protein at the phospholipid membrane interface.* **Barry Liang**, Stephen Valentine & Justin Legleiter.

**Poster 5:** *Examining the neurodevelopmental expression patterns of *gsx1* and *gsx2* in zebrafish.* **Sarah Peterson** & Sadie A. Bergeron.

**Poster 6:** *The search for the francisella-like endosymbiont in West Virginia dog ticks.* **Christine Doepker**, Victoria Verhoeve & Timothy Driscoll.

**Poster 7:** *Extraction of soybean compounds for anticancer assays.* **Paige Palumbo** & Nik Kovinich.

**Poster 8:** *Evolution of the innervation of the mesothoracic to deutocerebral histaminergic neuron in lepidoptera.* **Erica J. Haught**, Kassandra E. Riggs, Kevin C. Daly, Samuel P. Bradley, Phillip D. Chapman & Andrew M. Dacks.

**Poster 9:** *Precise quantification of olfactory stimuli using laser induced fluorescence.* **Luke A. Neal**, Zachary D. Short, Edward B. Flagg, Kevin C. Daly & Earl E. Scime.

**Poster 10:** *Fibroblast growth factor streamlines growth of mesenchymal stem cells.* **Cristin E. Dolan**, Reem Eldawud & Cerasela Zoica Dinu.

**Poster 11:** *Isolation of hox gene "deformed" from *Euwallacea validus*.* **Eliot Guerra-Blackmer**, Ellie Spahr & Teiya Kijimoto.

**Poster 12:** *Development of an atomic force microscopy based assay to determine the impact of lipids on huntingtin aggregation.* **Garima Agarwal** & Justin Legleiter.

**Poster 13:** *Polymorphisms in *DIP5* contribute to glyphosate resistance in *Saccharomyces cerevisiae*.* **Audrey Biega** & Jennifer Gallagher.

## Biological Sciences Category

### Bio Sci Poster 1:

#### **Effect of reactive oxygen species generators on mitoNEET expression in astrocytes and brain endothelial cells**

Patricia H. Doyle,<sup>1,2</sup> Briah Gaasch,<sup>2</sup> Rowaa Aljammal,<sup>2</sup> Wei Wang,<sup>1</sup> Sujung Jun,<sup>3</sup> Candice M. Brown,<sup>1</sup> and Werner J. Geldenhuys<sup>2</sup>

<sup>1</sup>*Department of Neurobiology and Anatomy,* <sup>2</sup>*Department of Pharmaceutical Sciences,* <sup>3</sup>*Department of Physiology and Pharmacology, West Virginia University, Morgantown WV 26506*

Mitochondrial dysfunction has been linked to several diseases including the neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. In recent studies the mitochondrial protein mitoNEET has shown to be an important regulator of cellular bioenergetics and mitophagy and shows promise as a treatment for neurodegeneration. In this study, we evaluated the effects of cellular stressors, including the complex I inhibitor rotenone, LPS and SIN-1, on mitoNEET expression in rat astrocytes and human brain endothelial cells. We employed quantitative real time PCR (qPCR) to examine the effects of these cellular stressors on mitoNEET mRNA expression and the expression of other genes that regulate oxidative stress and cellular bioenergetics in brain cells. Our findings suggest different pathways may be affecting mitochondrial mitoNEET expression in astrocytes and brain endothelial cells. The results of this study will be useful in designing selective compounds, which could slow down the disease progression in neurodegenerative diseases.

### Bio Sci Poster 2:

#### **Expression of ADAM9 and canonical Wnt signaling components in human colorectal cancer tissues**

Natalie Hobeika, Mark Perfetto, and Shuo Wei

*Department of Biology, West Virginia University, Morgantown, WV 26506*

The disintegrin and metalloprotease ADAM9 and canonical Wnt signaling are individually critical for cancer metastasis in multiple cancer types. In this study, we extracted the mRNA and protein from human colorectal cancer tissues to compare ADAM9 with the components of canonical Wnt signaling, which is known to have a role in carcinogenesis when misregulated. The separation of the protein and mRNA was performed with an RNeasy kit so that the content could be analyzed via Western blots and RT-qPCR. In addition, the genomic DNA will be extracted and sequenced so that we can examine for additional copies of *adam9* gene within the tumors. At the protein level, the results from the Western blots indicate that there is no association between ADAM9 and  $\beta$ -catenin concentration, signifying that ADAM9 does not regulate canonical Wnt signaling *in vivo*. However, we plan to compare ADAM9 with known canonical Wnt targets and modulators—which include ephrin ligands, TCF/Lef, c-myc, Axin2, snail, and slug—at the protein and RNA levels.

## Biological Sciences Category

### Bio Sci Poster 3:

#### **Optimizing a small peptide's ability to inhibit huntington aggregation in lipid membranes**

Kathryn L. Kapp and Justin Legleiter

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Huntington's disease (HD) is a neurodegenerative disease caused by an extended polyglutamine domain near the N-terminus of the Huntingtin (htt) protein, which leads to the growth of amyloid fibrils. Membrane-related changes associated with htt aggregation are a biochemical feature of HD. The first 17 amino acids of htt (Nt17) function as a membrane binding domain that is regulated by post-translational modifications such as acetylation and phosphorylation. Nt17 co-incubated with htt inhibits aggregation, but it is possible the presence of lipid membranes could reduce the efficiency of inhibition by isolating Nt17. Therefore, thirteen different mutant Nt17 peptides, six of which were acetylated and seven of which were phosphorylated, were studied to determine the optimal balance between affinity for htt or lipid membranes. Thioflavin assays and atomic force microscopy were used to monitor amyloid formation. Preliminary results from the thioflavin assays suggest that each peptide inhibits aggregation; however, experimental

### Bio Sci Poster 4:

#### **Determining chemical interaction between small-molecule aggregation inhibitors and huntingtin protein at the phospholipid membrane interface**

Barry Liang, Stephen Valentine, and Justin Legleiter

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Expansion of a polyglutamine tract in the Huntingtin (htt) protein results htt aggregation into amyloid fibrils associated with Huntington's Disease. Furthermore, subcellular lipid membrane damage is associated with htt aggregation. Several small-molecules (EGCG, riluzole, curcumin, thioflavin T, and Congo red) generically inhibit amyloid formation of several proteins; however, many of these inhibitors are ineffective in the presence of lipids. Here, we investigated the chemical interaction between small-molecule amyloid inhibitors and htt in the presence of lipid membranes. A polydiacetylene assay suggested EGCG and thioflavin T were ineffective in altering htt aggregation at lipid membranes. Curcumin (dose dependent) and riluzole (dose independent) inhibited htt interaction with lipid membranes. Congo red enhanced htt lipid binding. To potentially elucidate underlying mechanisms associated with the varying ability of inhibitors to prevent htt aggregation in the presence of lipids, a structural analysis by electrospray ionization-ion mobility spectrometry-mass spectrometry (ESI-IMS-MS) was initiated, revealing potential EGCG binding sites on htt. Although lipids influenced the efficacy of amyloid inhibitors, further binding and structural analysis are necessary to ascertain the underlying mechanisms.



## Biological Sciences Category

### Bio Sci Poster 5:

#### **Examining the neurodevelopmental expression patterns of *gsx1* and *gsx2* in zebrafish**

Sarah Peterson and Sadie A. Bergeron

*Department of Biology, West Virginia University, Morgantown, WV 26506*

Previous work performed in zebrafish and mouse strongly supports the hypothesis that the *genomic screen homeobox* genes, *gsx1* and *gsx2*, play an important role in the functional development of neural circuits for startle reflex modulation, a process frequently impaired in patients with schizophrenia. Completely defining the expression pattern of these genes at distinct developmental time points is a key first step in determining their unique and overlapping functions. To address this, we first obtained a collection of *gsx1* mutant embryos and their wild type (wt) siblings of various ages. *In situ* hybridization and RT-PCR was performed to determine when and where *gsx1* and *gsx2* are expressed. Similar to other vertebrates, it was found that *gsx2* is first expressed at an early somitogenesis stage, 12 hours post fertilization. Unlike *gsx1*, *gsx2* expression is absent from the midbrain and restricted to the ventral forebrain, telencephalon, spinal cord and caudal hindbrain. We plan to explore expression of these transcription factors further at additional ages and in mutants to reveal more about their roles across the nervous system.

### Bio Sci Poster 6:

#### **The search for the francisella-like endosymbiont in West Virginia dog ticks**

Christine Doecker, Victoria Verhoeve, and Timothy Driscoll

*Microbial Metagenomics Lab, Department of Biology, West Virginia University, Morgantown, WV 26506*

Endosymbionts of infectious disease causing vectors have been receiving interest recently in the microbial world due to their potential interactions with the arthropod host microbiome and pathogenic bacteria. Additionally, there may also be an association between the presence of an endosymbiont and the exclusion of human disease causing bacteria from infecting the vector as is the case with *Rickettsia rickettsii* and *Rickettsia peacockii*. In this study, *Dermacentor variabilis* (American dog tick) were collected from various counties in West Virginia to identify the distribution of the *Francisella*-like endosymbiont. We hypothesize that the *Francisella*-like endosymbiont would be present in *D. variabilis* ticks in West Virginia. Traditional PCR analysis and gel electrophoresis of two *Francisella*-specific 16S gene regions indicated a prevalence of the *Francisella*-like endosymbiont of approximately 47%. The identification of the *Francisella*-like endosymbiont in West Virginia American dog ticks will further lead to a better understanding of the ecology of arthropod microbiomes.

## Biological Sciences Category

### Bio Sci Poster 7:

#### Extraction of soybean compounds for anticancer assays

Paige Palumbo<sup>1</sup> and Nik Kovicich<sup>2</sup>

<sup>1</sup>Eberly College of Arts and Sciences and <sup>2</sup>Davis College: Division of Plant and Soil Sciences, West Virginia University, Morgantown WV 26506

Multidrug resistance has become prevalent among cancer cells, especially during chemotherapeutic treatments. It is known that natural plant products of soybeans, such as apigenin and sakuranetin (SAK), have anticancer activity. We predict that chemical modifications of these compounds will increase their potency. Apigenin has been extracted from soybeans and transformed by bacteria to produce 7-O-Methyl-Apigenin (7OMA). Through the use of thin layer chromatography and LCMS, 7OMA has been extracted, purified and identified. We have coupled SAK with isoxazole compounds to produce a heterodimer molecule, which we hypothesize to have high cytotoxic activity. The results of coupling reactions of SAK with 3-Amino-5-(4-bromophenyl)isoxazole [3-ABI] and with Methyl-5-(4-hydroxyphenyl)isoxazole-3-carboxylate [MSX] are being analyzed with LCMS. The products of these reactions will be identified followed by purification through HPLC methods. Eventually, 7OMA and a product of the SAK coupling reactions will be tested against human cancer cell lines. A control group will be treated by Glyceollin I – a soybean compound known to reduce cancer cell activity. Toxicity assays will then be carried out to determine the effects of these novel compounds on the cells.

### Bio Sci Poster 8:

#### Evolution of the innervation of the mesothoracic to deutocerebral histaminergic neuron in lepidoptera

Erica J. Haught, Kassandra E. Riggs, Kevin C. Daly, Samuel P. Bradley, Phillip D. Chapman, and Andrew M. Dacks

*Department of Biology, West Virginia University, Morgantown, WV 26506*

Food and mate search behaviors are often mediated by evolutionary constraints that shape the structure and function of neural circuits. Circuits involving motor systems that highly modulate sensory systems are called corollary discharge (CD) circuits which have been studied in visual and auditory but not in olfactory systems. Two histaminergic neurons project from flight sensorimotor centers to the antennal lobes (AL) in *Manduca sexta*, but it remains unknown whether the circuit is a general feature of all Lepidoptera or specific to certain behavioral ecologies. We employed a comparative project including nocturnal and diurnal insects to provide evidence regarding the function of the neuron, predicting nocturnal Lepidoptera will have histamine in their AL since they may rely more on olfaction than vision. We gathered nocturnal *Grapholita molesta* and *Bombyx mori* and diurnal *Papilio* and *Pieris*. We performed immunocytochemistry protocols to locate the presence or absence of histamine and histamine receptor in their AL. Results showed the presence of histamine in the AL of *Grapholita molesta* and *Bombyx mori* and no histamine in the AL of *Papilio*.

## Biological Sciences Category

### Bio Sci Poster 9:

#### **Precise quantification of olfactory stimuli using laser induced fluorescence**

Luke A. Neal<sup>1</sup>, Zachary D. Short<sup>1</sup>, Edward B. Flagg<sup>1</sup>, Kevin C. Daly<sup>2</sup>, and Earl E. Scime<sup>1</sup>

<sup>1</sup>*Department of Physics and Astronomy and* <sup>2</sup>*Department of Biology, West Virginia University, Morgantown, WV 26506*

One major problem that exists in the study of biological sensory systems, specifically olfactory sensory systems, is our inability to measure and quantify the interaction of olfactory stimuli with olfactory sensory receptors. This problem arises due to the difficulty of measuring complex odorant spatial distributions near the sensory receptor. Currently, there are no methods capable of precisely quantifying these distributions. We propose utilizing laser-induced fluorescence (LIF) to image odors as they interact with the olfactory sensory array in the moth *Manduca sexta*, while measuring the sensory response in the moth's brain. The use of LIF to fluoresce odorants enables the of capture high speed, high-resolution images of the odorant structure as it varies with time at the location of the sensory array. The goal of this experiment is to develop a method to map the relationship between olfactory stimuli and olfactory sensory receptors, providing significant improvements in our understanding of olfactory systems.

### Bio Sci Poster 10:

#### **Fibroblast growth factor streamlines growth of mesenchymal stem cells**

Cristin E. Dolan, Reem Eldawud, and Cerasela Zoica Dinu

*Departments of Chemical and Biomedical Engineering, Statler College, West Virginia University, Morgantown, WV 26506*

Stem cells hold incredible promise in the medical field for use in tissue scaffolds and regenerative therapies. However, to allow for optimal designs, stem cell growth must be efficiently controlled to induce their rapid replication. Key elements such as growth factors must be manipulated during their cellular development so ideal growing conditions may be reached. In this research project we investigated the effects of fibroblast growth factor (FGF-2) on the growth profile of human infrapatellar fat pad derived stem cells (IPFPs), a viable model for cartilage and bone regeneration. Optical microscopy images provided information on cell number and topography, as well as cellular characteristics such as area and height. Analysis of fluorescent microscopy images revealed different structural patterns of growth for the two treatment groups. Further results showed that FGF-2 treated cells proliferated faster, had a more fibrous shape, and a smaller surface area than cells grown in standard cellular media. This study establishes a controlled platform for rapid stem cell proliferation so future tissue engineering designs may develop quickly and accurately.

## Biological Sciences Category

### Bio Sci Poster 11:

#### Isolation of hox gene “deformed” from *Euwallacea validus*

Elliot Guerra-Blackmer, Ellie Spahr, and Teiya Kijimoto

*Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506*

Ambrosia beetles species *E. validus*, native to Asia, is a vector for wood decaying fungi and a minor pest in North America. They possess an obligate nutritional symbiosis with the fungi *Fusarium* sp. Female *E. validus* vector the fungal symbionts via mandibular mycangia. To understand the evolutionary/ecological importance of the symbiosis, it is important to explore the underpinnings of mycangia. HOX genes are a highly conserved superclass of developmental genes responsible for body segment identification. We hypothesized that the HOX gene *Deformed (Dfd)*, which has been shown to be responsible for mandible development in other insect species, may be responsible for mycangia development. Since *E. validus* is not a model organism, we attempted to clone its *Dfd* gene to examine its function. Currently, we have successfully cloned a partial sequence of *E. validus*' *Dfd* gene and confirmed its high similarity with *Dfd* from other insect species. Ultimately, the function of *Dfd* will be studied with RNAi treatment on developing beetles, repressing its function to see its purpose can be investigated.

### Bio Sci Poster 12:

#### Development of an atomic force microscopy based assay to determine the impact of lipids on huntingtin aggregation

Garima Agarwal and Justin Legleiter

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26505*

Huntington's Disease is a fatal neurodegenerative disease caused by abnormal amount of CAG repeats in the Huntingtin gene which encode an expanded polyglutamine domain in the N-terminus of the Huntingtin(htt) protein. Furthermore, htt has an affinity for lipid bilayers, but the influence of specific lipid components on htt aggregation is poorly understood. Here, we develop an assay to determine how lipid vesicles influence htt aggregation in bulk solution by sampling a co-incubation of htt with lipid vesicles of varying composition for atomic force microscopy (AFM) analysis. This requires optimization of several parameters associated with sample deposition onto a mica substrate. Initial efforts were focused on determining deposition protocols for lipid vesicles alone so that stability of vesicles in the absence of htt could be established by AFM. Optimal conditions were determined to be an exposure time of 1 minute followed by a wash of 200 microliters of ultrapure water. Once this procedure is optimized for lipids alone, the co-incubation with htt will be performed.

## Biological Sciences Category

### **Bio Sci Poster 13:**

#### **Polymorphisms in *DIP5* contribute to glyphosate resistance in *Saccharomyces cerevisiae***

Audrey Biega and Jennifer Gallagher

*Department of Biology, Eberly College of Arts and Science, West Virginia University, Morgantown, WV 26505*

Yeast is a commonly utilized model organism for eukaryotes because of the ease by which their genes can be manipulated and the resulting phenotypic changes can be studied. Widespread use of glyphosate, an inhibitor of aromatic amino acid synthesis, has resulted in genetic adaptations in isolated wild yeast strains to develop glyphosate resistance. Previous data suggests that a gene located on chromosome 15 is associated with glyphosate sensitivity. *DIP5*, located on chromosome 15, is of particular interest as it assists in the transport of negatively charged amino acids into the cell, whereas glyphosate shares a similar charge and molecular structure. Preliminary data shows that polymorphisms in *DIP5* contribute to glyphosate resistance as the knock out strain displayed increased viability, suggesting that polymorphisms in *DIP5* resulting in altered protein function prevent the uptake of glyphosate into the cell.

## Engineering Category

### Eng Category Index:

**Poster 1:** *Direct writing of TiO<sub>2</sub> photoanodes for dye sensitized solar cells.*

M. Torres Arango, **D.T. Cipollone**, L.O. Grant & K.A. Sierros.

**Poster 2:** *Comparison of pristine and thermally degraded nanoclay toxicity in human lung epithelial cells.* **Soofia N. Lateef**, Alixandra Wagner, Andrew White & Cerasela Zoica Dinu.

**Poster 3:** *Development of a model to gain quantitative data of dielectric barrier discharge plasma actuators.* **Amos C. Powell**, Patrick H. Browning & Joseph P. Dygert.

**Poster 4:** *Analysis of a jet engine nozzle exhaust flow by using Schlieren imaging.*

**Jaya Karlapati**, Bryan Shambaugh & Patrick H. Browning.

**Poster 5:** *Soldering in a microgravity environment.*

**William D. Moon IV** & John Kuhlman.

**Poster 6:** *Demonstration of a methodology for automated model building with physical CO<sub>2</sub> sorbents.* **Keenan X. Kocan** & David S. Mebane.

**Poster 7:** *Software fault-proneness: an exploration in improving prediction accuracy.*

**Lucas K. Darnell**, Mohammad J. Ahmad & Katarina Doseva-Popstojanova.

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## Engineering Category

**Poster 16:** *Electrocatalytic water oxidation by NiO and Ni(OH)<sub>2</sub> nanoplatelet arrays.*

**James Turner**, Jiangtian Li, Joseph Bright & Nianqiang Wu.

**Poster 17:** *High surface area electrochemical double layered capacitors.*

**Dustin Bragg**, Ross Levelle, Engin Ciftyurek & Edward Sabolsky.

## Engineering Category

### Engineering Poster 1:

#### **Direct writing of TiO<sub>2</sub> photoanodes for dye sensitized solar cells**

M. Torres Arango, D.T. Cipollone, L.O. Grant, and K.A. Sierros

*Flexible Electronics for Sustainable Technologies FEST Laboratory, Mechanical and Aerospace Engineering Department, West Virginia University, Morgantown, WV 26505*

Dye sensitized solar cells (DSSCs) are of great interest as alternative solar cells, due to their lower fabrication cost since no high purity materials are required, as opposed to the conventional, highly pure Si crystalline cells. The photoanode of the cell, commonly made of TiO<sub>2</sub>, is a pivotal component of the system, being the electron transport material and template for the dye molecules. This research focuses on the development of a porous, yet continuous TiO<sub>2</sub> layer through direct writing of TiO<sub>2</sub> solution based inks onto 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 patterning method is found to be highly dependent on the ink's viscosity, tailored by varying the ratios of the crystalline TiO<sub>2</sub> to Ti-organic-precursor. Additionally, the printing can be further aided by the inclusion of polymers into the formulation. The resulting films were characterized through profilometry to understand the relationships between the printing parameters and the films' surface characteristics.

### Engineering Poster 2:

#### **Comparison of pristine and thermally degraded nanoclay toxicity in human lung epithelial cells**

Soofia N. Lateef, Alixandra Wagner, Andrew White, and Cerasela Zoica Dinu

*Department of Chemical and Biomedical Engineering, West Virginia University, Morgantown, WV 26506*

Incorporating montmorillonite nanoclays into polymers results in the formation of nanoclay-based composites with improved durability and decreased gas permeability. Such composites are currently used in food packaging applications, with the above properties significantly decreasing food spoilage. However, when food packaging is being manufactured or disposed by incineration, the encapsulated nanoclays may be released. If inhaled by a worker, the nanoclays could interact with exposed tissue, with such contact leading to safety concerns. Herein we aimed to establish the toxicity profiles of a commercial nanoclay used in food packaging applications (I.44P) and its thermally degraded counterpart (used as a model for disposal). For this, we used bronchial epithelial cells to mimic lung inhalation and experimental approaches based on colorimetric and enzymatic assays. Our results showed that both nanoclays have a dose dependent toxicity, with a higher toxicity being observed for I.44P relative to its thermally degraded counterpart. Future studies will include primary cells for ensuring pertinent models for toxicity with applicability in occupational exposures.

## **Engineering Category**

### **Engineering Poster 3:**

#### **Development of a model to gain quantitative data of dielectric barrier discharge plasma actuators**

Amos C. Powell, Patrick H. Browning, and Joseph P. Dygert

*Department of Mechanical & Aerospace Engineering and Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506*

A relatively new technology in aerospace engineering is the plasma actuator. One current challenge facing plasma actuators is obtaining accurate, quantitative results. Several classical flow-measuring techniques have been employed but are usually limited in the scope of obtainable data due to electromagnetic and/or optical interferences from the plasma. In this study a wing model was developed, based on a NACA 0012 aerofoil, to obtain real-time steady-state flow data. This was accomplished by creating a number of static pressure ports oriented in the normal direction with respect to the surface of the wing. The pressure ports were attached to a manometer bank that was used to gather data under multiple testing conditions. The results are expected to agree with other studies done using the NACA 0012. Further research must be done to compare the results of the model to one with a dielectric barrier discharge (DBD) actuator attached. The significance of the study was to establish a starting point to obtain quantitative data on the affect plasma actuators have on the performance of the wing.

### **Engineering Poster 4:**

#### **Analysis of a jet engine nozzle exhaust flow by using Schlieren imaging**

Jaya Karlapati, Bryan Shambaugh, and Patrick H. Browning

*Mechanical and Aerospace Engineering Department, Statler College of Engineering Resources, West Virginia University, Morgantown, WV 26506*

Exhaust flow exiting a jet engine nozzle differs in density from ambient air. However, this is not typically visible to the naked eye. This study focused on implementing and calibrating a Z-type Schlieren Flow Visualization System to capture high-speed videos of the exhaust plume exiting a nozzle. Compressed air simulated exhaust flow for experimental purposes. The system uses two concave mirrors, an LED, and a knife's edge to manipulate the reflection and refraction of light passing through the nozzle exhaust plume to produce an image. This grayscale image indicates different densities as various shades of grey. A high-speed camera recorded the projected exhaust flow at starting pressures of 40, 50, 60, and 70 psi. Analysis was performed by comparing video frames for each pressure revealing that darker shades indicated higher densities. Additionally, the clearest schlieren images were found at the following specifications: 65" between the LED and mirror one, 17" between the knife's edge and mirror one, and 9.5" between the LED and mirror two.

## **Engineering Category**

### **Engineering Poster 5:**

#### **Soldering in a microgravity environment**

William D. Moon IV and John Kuhlman

*Statler College of Engineering, West Virginia University, Morgantown, WV 26506*

How can the quality of joints soldered in microgravity be improved? A common problem with soldering in microgravity comes from the formation of gas pockets in the solder as it solidifies. This stems from the heating of the antioxidant flux inside of the solder paste itself. As the solder paste is heated the flux vaporizes and, normally, would escape through the surface of the solder due to separation by gravity. However, in a microgravity environment this is not possible and a different method must be used to separate the gas from the molten solder. One way of accomplishing this is to disperse very small iron particles uniformly in the solder to make it magnetic. Then if the soldering is done in a strong local magnetic field, the flux vapor should be driven out of the molten solder by the magnetic body force. Several different solder paste mixtures heated at different temperatures have been examined for signs of weaknesses such as bubble formations and clumping of iron particles using electron microscopy. Through many tests, the outcomes have shown the behaviors of solders with different amounts of iron particles and the effects of being heated at varying temperatures leading to a conclusion of which combination works best.

### **Engineering Poster 6:**

#### **Demonstration of a methodology for automated model building with physical CO<sub>2</sub> sorbents**

Keenan X. Kocan and David S. Mebane

*Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University,  
Morgantown, WV 26506*

This research demonstrated a method for automatically building and calibrating models given a provided dataset with the application being adsorption of CO<sub>2</sub> on the physical adsorbent zeolite 13X. Starting with a Langmuir Isotherm for modeling of the CO<sub>2</sub> adsorption, the method equips the model with Gaussian process stochastic functions. The stochastic functions consist of a series of spectral, nonparametric, orthogonal and ordered basis functions. Due to the functions being ordered, they may be added to the model in a rational fashion. Each additional term provides the model a better fitting, though each added term requires an additional parameter to be estimated in the calibration and the model could be over-fitted with the inclusion of too many terms. The method of Bayes factors was deployed to find a balance between model fidelity and model simplicity. Bayesian calibration determines a distribution of model parameters that is consistent with the data; an adaptive sampling routine was implemented to carry out the calibration.

## Engineering Category

### Engineering Poster 7:

#### **Software fault-proneness: an exploration in improving prediction accuracy**

Lucas K. Darnell, Mohammad J. Ahmad, and Katarina Goseva-Popstojanova

*Lane Department of Computer Science and Electrical Engineering, West Virginia University,  
Morgantown, WV 26506*

In software fault-proneness prediction, data from the past are used to create models that detail which parts of a software application are likely to have faults in the future. These models provide developers with insight as to which parts of their software to develop and test more carefully, leading to better allocation of resources. This work was part of a large, existing research work focused on exploring the multitude of factors that affect the accuracy of software fault-proneness predictions. In this study, two types of metrics, namely change (from bug reports and change logs) and static code (from the binaries of each release), were extracted from a total of 63 releases of 14 different open source projects. After verification and validation of data quality, these metrics were aggregated. Two machine learning algorithms, J48 and Random Forest, were used to compute the confusion matrices and report learners' performance using different datasets and metrics families.

### Engineering Poster 8:

#### **Automatic diagnostic tool for in-home ear infection detection**

Olivia Santee<sup>1</sup>, James Smith<sup>1</sup>, Mathew Smith<sup>2</sup>, Andrew Smith<sup>2</sup>, and James Hunsucker III<sup>1</sup>

<sup>1</sup>*Benjamin M. Statler College of Engineering and Mineral Resources and*

<sup>2</sup>*West Virginia University Hospital, West Virginia University, Morgantown, WV 26506*

Currently, the method for diagnosing ear infections requires a doctor's visit in order to determine the best treatment options. For parents with young children, the doctor's office is an all too familiar place frequently visited by those with ear infections; unfortunately, parents have no way of knowing whether their child's ear pain is infectious and it must be treated by antibiotics or it is viral and the pain can be alleviated with over-the-counter medication. Creating an in-home diagnostic tool will allow parents to quickly and accurately determine the state of their child's condition. By integrating image capturing and processing capabilities into the body of an otoscope, the device will be able to pick up on key symptoms targeted by medical professionals such as the position of the tympanic membrane, temperature, mobility, shape, and color. The implications of this research have the potential to result in a profound impact on society, by allowing children to receive accurate in-home diagnostics while parents spend less time and money, with needless office visits.

## **Engineering Category**

### **Engineering Poster 9:**

#### **Numerical simulations of flame propagation in dusty-gaseous environment**

Torli Bush, Sinan Demir, and V'yacheslav Akkerman

*Center for Alternative Fuels, Engines and Emissions, Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506*

While combustion of gaseous fuels and that of dust have been studied, separately, reasonably well, ignition and flame propagation in a combined dusty-gaseous environment still remain almost an enigma that commands both the fundamental and practical interests. In particular, accidental methane-air explosions and fires in the presence of combustible dust frequently occur in coalmines and claim hundreds of lives annually. To reduce the risk of such disasters, a fundamental understanding of the combustion process is critically needed. This project is a step in this direction undertaken by means of comprehensive computational simulations of fully compressible hydrodynamic, combustion and dust equations. Two categories of dust are considered and implemented into the simulations, namely: (i) combustible (say, coal particles), and (ii) inert dust (say, sand). For each category, four dust distributions are studied, specifically, (a) homogenous, (b) linear, (c) parabolic and (d) cubic, with three different pipe radii employed. As a result, flame parameters such as the flame shape and velocity as well as the flame acceleration rate are calculated.

### **Engineering Poster 10:**

#### **Real time kinematic printed circuit board unmanned aerial vehicle base station**

Keegan M. Mueller and Jason N. Gross

*Benjamin M. Statler College of Engineering & Mineral Resources, West Virginia University, Morgantown, WV 26505*

In the case of testing UAV's, large spaces are required, which often leads to tests conducted outside in open spaces. An essential component of testing UAV's is the base station which tracks and transmits a UAV's location with GPS. Due to sporadic weather in West Virginia—i.e. rain—testing often has to be postponed. Traditional RTK base stations have many open connections which are sensitive to water damage, are bulky, and are also energy inefficient due to large components needed like the computer. In order to make UAV flight testing simpler, we designed a printed circuit board (PCB) which could accomplish all of the necessary tasks of a traditional RTK base station while at the same time eliminating the need to have a computer as a part of the base station. By designing a small PCB we eliminated the need to have a large power source and also used a 3D printed, waterproof box to enclose the board, therefore allowing for the base station to be set up and use quickly even in heavy rains.

## **Engineering Category**

### **Engineering Poster 11:**

#### **Integration of VL6180X rangefinder sensors on a robotic platform for semi-autonomous navigation**

David-Michael A. Buckman and Powsiri Klinkhachorn

*Lane Department of Computer Science and Electrical Engineering, West Virginia University,  
Morgantown, WV 26506*

After designing a robot for the Mercury Robotics Competition last year, there were numerous improvements that were conceived, one of which was the addition of sensors and a collision detecting algorithm. These improvements will reduce the strain on the operator, allowing them to focus on the objective for the competition. This research will allow the robot to monitor its surroundings and employ a course correction algorithm to avoid collisions. In order to acquire experimental data, a robotic platform will be built to the specifications listed in the Mercury Robotics Competition. The robot will have multiple VL6180X rangefinder sensors embedded into the chassis at strategic positions to gather environmental data for the algorithm. The robot will include a Lithium Polymer rechargeable battery for a power source, which requires safety circuits to prevent unsafe operation. The research has been stymied by a piece of under documented hardware, slowing our research a tiny amount, but a workaround method of data collection is looking promising. Preliminary results show that the sensors are able to detect objects from 40cm away.

### **Engineering Poster 12:**

#### **Electroluminescent characterization of on-orbit III-V nitride-based LEDs**

Catherine G. O'Hearn, Matthew Pachol, and Jeremy Dawson

*Lane Department of Computer Science and Electrical Engineering, West Virginia University,  
Morgantown, WV 26506*

NASA's Independent Verification and Validation (IV&V) Facility and West Virginia University have partnered for the deployment of the Simulation-to-Flight 1 (STF-1) CubeSat Mission. STF-1 is a 3U CubeSat that houses both NASA and WVU experiments, including an in-house designed optoelectronic characterization tool for verification of the performance and durability of on-orbit III-V nitride-based LEDs, for which a poster was accepted for the 30<sup>th</sup> Annual Small Satellite Conference. III-V nitride-based LEDs are more radiation resistant than their silicon counterparts, therefore potentially requiring less shielding and producing lighter, more efficient satellites. This experiment consists of two circuits; one for forward voltage measurements, the other containing photodiode arrays to collect the spectral response of each LED. Because the operation of LEDs can be monitored by observing shifts in the emission wavelength, the goal of this work is to design a low-power electroluminescent spectrometer to measure LEDs emitting at a wavelength of 465nm while on orbit. The system has dimensions of 3.5in x 3.75in and adheres to the .77W power budget.

## **Engineering Category**

### **Engineering Poster 13:**

#### **Measurement of dust deposition according to reflectance intensities**

Frank M. Notarnicola and John A. Christian

*Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University,  
Morgantown, WV 26506*

The detection and measurement of the accumulation of dust on the surface of solar panels is important for rovers that are exploring celestial bodies. By utilizing a camera with a high pixel density, the average amount of dust that rests on a vehicle surfaces (e.g. solar panels) can be calculated by observing how the amount of light reflected by a dusty surfaces differs from that of a clean surface. For experimentation, it is essential that the dust manufactured in the laboratory should exhibit similar dimensional characteristics of planetary dust. By implementing a filter to obstruct the passage of dust particles with a diameter above 100 microns, this will minimize any interpreted fallacies by the program due to particle clumping. Currently, tests are being conducted to validate the proposed approach and supporting computer programs.

### **Engineering Poster 14:**

#### **Mathematical modeling and analysis of a modular natural gas combined cycle power plant**

Zachary A. Kilwein, Juan C. Carrasco, and Fernando V. Lima

*Department of Chemical and Biomedical Engineering, West Virginia University, Morgantown, WV 26506*

The increasing focus on environmental safety and decreasing reserves of fossil fuels have forced the power industry to look for creative approaches to tackle the high energy demand while minimizing carbon footprint. Natural gas' portion of US energy production has increased from 15% in 2006 to 33% in 2016. Natural Gas Combined Cycle (NGCC) power plants represent a cleaner, more efficient alternative to traditional coal plants. Availability of customizable NGCC modular designs could solve issues such as remote drilling areas, or provide unique industrial applications. However, comprehensive studies of these modular systems are scarce. This research contributes with energy and mass balanced models in MATLAB of a simulated modular micro-cogeneration system, providing a basis of comparison to larger existing combined cycle models. Existing NGCC data of traditional plants are obtained from DOE reports, while consumer modules were selected as baselines for modular performance and limitations. Preliminary results suggest that power generation in the modular set up is possible, however the big challenge is to find the adequate size with respect to the electricity demand.



## Engineering Category

### Engineering Poster 15:

#### **Functional comparisons of microtubules and derived bio-based hybrids through microscopy assays**

Margaret A. Neely, Xiao Hu, and Cerasela Zoica Dinu

*Department of Chemical and Biomedical Engineering, West Virginia University, Morgantown, WV 26505*

The properties of the tubulin protein that forms structural cellular components could offer a unique framework for the next generation of nanowires and synthetic device applications. However, such protein is difficult to manipulate outside of the cellular environment mainly because it loses stability and functionality, while also lacking conductivity. To make tubulin applicable for the envisioned applications, the creation of bio-conductive hybrids has been proposed. To do so, the biological recognition and self-assembly of tubulin onto conductive sulfur-doped carbon nanodots were exploited. The resulting bio-based hybrids were compared with control microtubules created only from tubulin by using microscopy assays and kinesin molecular motors. Analysis of functionality suggested that the speeds of the control microtubules and biohybrids were comparable at varying concentrations of kinesin. Such results confirmed the functionality of the biohybrids while allowing the creation of a new “material” to be further tested for its conductivity and applicability as nanowire for synthetic application.

### Engineering Poster 16:

#### **Electrocatalytic water oxidation by NiO and Ni(OH)<sub>2</sub> nanoplatelet arrays**

James Turner, Jiangtian Li, Joeseeph Bright, and Nianqiang Wu

*Department of Mechanical and Aerospace Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506*

As energy demand continues to increase, solar energy is becoming a clear candidate to address global energy needs. Solar photovoltaic arrays have been used to power electrical devices for years. However, the sun's energy also has great potential for use in fuel production. This can be achieved by using electricity generated by a solar photovoltaics to oxidize water and produce hydrogen gas. Transition metal oxides are currently of particular interest for researchers as electrocatalysts due to their earth abundance versus traditional electrocatalysts containing precious metals such as platinum and ruthenium. This presented work investigates nickel (II) oxide and nickel (II) hydroxide nanoplatelet arrays for their performance and efficiency for electrocatalytic water oxidation. The obtained results show that nickel (II) oxide nanoplatelets are a promising, cost effective water oxidation electrocatalyst versus precious metal containing ruthenium (IV) oxide.

## Engineering Category

### Engineering Poster 17:

#### **High surface area electrochemical double layered capacitors**

Dustin Bragg, Ross Levelle, Engin Ciftyurek, and Edward Sabolsky

*Benjamin M. Statler College of Mechanical and Aerospace Engineering, West Virginia University,  
Morgantown, WV 26506*

Electrochemical double layered capacitors or supercapacitors are manufactured using organic carbon materials. Different kinds of carbon materials can be used as electrodes in these supercapacitors. Many BET and HK tests were run to determine the surface area, pore size distribution, and pore volume of multiple carbon materials. These results were used to characterize the carbon materials. The carbon materials that were selected consisted of high surface area phosphoric acid impregnated blueberry concentrate, phosphoric acid impregnated glycherry, and their low surface area not impregnated counterparts; these powder were derived from blueberries and glycherry respectively. The materials were then prepared into inks for manufacturing. The manufacturing process began by tape casting the carbon materials on to stainless steel current collectors. They were then assembled inside the architecture of a normal battery. Once manufactured the supercapacitors were put through cyclic voltammetry and Galvano-static charge-discharge tests at a current of 0.8mA and between 0.2 and 0.5V. These materials as electrodes show great promise in future supercapacitor technology.

## Health Sciences Category

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**Poster 2:** *CRISPR/Cas9 deletion of drosha isoform and its role in microRNA biogenesis.* **Abby Harold**, Karen Hayes & Ivan Martinez.

**Poster 3:** *Mitochondrial miRNAs: novel disease-modifying therapeutic targets in Alzheimer's disease.* **Pooja A. Warriar**, Wei Wang, James W. Simpkins, Sujung Jun & Candice M. Brown.

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**Poster 13:** *Inhibition of glioblastoma multiforme tumors following exposure to a propanil analog.* **Kensey N. Bergdorf** & John B. Barnett.

**Poster 14:** *Identifying differential gene expression in cytotoxic T cells induced by B16F0 melanoma exosomes.* **Cassidy L. Bland**, Christina N. Byrne-Hoffman & David J. Klink II.

## Health Sciences Category

**Poster 15:** *Functional redundancy of OVOL and GRHL genes in the suppression of epithelial-to-mesenchymal transition (EMT).* **Joseph A. McGuire**, Elizabeth Duarte, James T. Boothe, James H. Fugett & Alexey V. Ivanov.

**Poster 16:** *Total brain lipid extract peroxidation kinetics.*  
**Timothy M. Ferrebee**, Albert W. Pilkington III & Justin Legleiter.

**Poster 17:** *Donor-specific comparison of trilineage potential of mesenchymal stem cells.*  
**Hunter Snoderly**, Tyler Pizzute, Shanawar Waris, Karlee Lobban, Zach Werner & Ming Pei.

**Poster 18:** *Neural networking for marking the offset of ground reaction forces during rat gait.*  
**Adam Chivers**, Kiril Tuntevski & Sergiy Yakovenko.

**Poster 19:** *Descriptive investigation of risk factors associated with urological cancer.*  
**Alex Battin**, Tyler Overholt, Dale Riggs, Barbara Jackson & Stanley Zaslau.

## Health Sciences Category

### Health Sci Poster 1:

#### **Identifying potential virulence factors associated with the rugose phenotype in *Pseudomonas aeruginosa***

Matthew S. Epperly, Frederick H. Damron, and Mariette Barbier

*Department of Microbiology, Immunology, and Cell Biology, School of Medicine, West Virginia University, Morgantown, WV 26506*

*Pseudomonas aeruginosa* is a major nosocomial pathogen and our laboratory has identified several strains of this bacteria with a rugose, or wrinkled, phenotype. One of these mutant strains had a mutation in the gene *mntH1*. This gene encodes the uptake protein MntH1 that aids the bacteria in acquiring and utilizing manganese. Metal ions such as this play roles in biofilm forming processes as well as detoxifying reactive oxygen species such as those present in macrophages. This study focused on comparing *mntH1* mutants to wild type strains of *P. aeruginosa* in their ability to form biofilms as well as resist phagocytosis. A secondary goal was to genetically engineer a plasmid containing a functional copy of *mntH1*, use it to complement the mutation, and confirm that MntH1 is responsible for the different phenotypes observed. We hypothesize that strains deficient in *mntH1* are less capable of forming biofilms and neutralizing reactive oxygen species. If the experimental data supports our hypothesis, further studies in this area could lead to more effective treatments for patients with *Pseudomonas aeruginosa* infections.

### Health Sci Poster 2:

#### **CRISPR/Cas9 deletion of drosha isoform and its role in microRNA biogenesis**

Abby Harold, Karen Hayes, and Ivan Martinez

*WVU Cancer Institute, West Virginia University, Morgantown, WV 26505*

MicroRNAs (miRNAs) are small non-coding RNAs involved in posttranscriptional regulation of at least 70% of all human coding genes. The nuclear ribonuclease enzyme Drosha is an important part of the canonical miRNA biogenesis pathway but regulation of this protein in different cellular conditions is not well understood. Our group discovered a small isoform of Drosha present in the cytoplasm of cells during cellular growth arrest, suggesting an alternative microRNA biogenesis pathway during this process. In order to better understand the activity of this isoform, we will use the CRISPR/Cas9 system to delete the long isoform of the Drosha protein to look at the function of the short isoform in microRNA biogenesis during cellular growth arrest. Primary human fibroblast will be infected with a lentiviral vector expressing the CRISPR/Cas9 system targeting specifically the exon region of the large isoform of Drosha that is absent in the smaller isoform. A better understanding of alternative miRNA biogenesis pathways in different cellular conditions could provide information for the importance of miRNA biogenesis in different human diseases such as cancer.

## Health Sciences Category

### Health Sci Poster 3:

#### **Mitochondrial miRNAs: novel disease-modifying therapeutic targets in Alzheimer's disease**

Pooja A. Warriar<sup>1</sup>, Wei Wang<sup>1</sup>, James W. Simpkins<sup>2</sup>, Sujung Jun<sup>2</sup>, and Candice M. Brown<sup>1</sup>

*Department of Neurobiology and Anatomy<sup>1</sup> and Department of Physiology and Pharmacology<sup>2</sup>, West Virginia University School of Medicine, Morgantown, WV 26506*

MicroRNAs (miRs) are small non-coding RNAs that act at post-transcriptional level to regulate expression of proteins. Mitochondrial miRs have been studied prominently for their crucial involvement in cellular aging, inflammation, and mitochondrial function in neurodegenerative diseases including Alzheimer's disease (AD). Recent studies from our laboratory identified miR-146a and miR-34a as being overexpressed in specific brain regions of AD patients. An increase of these miRNA levels was highly correlated with a decrease in expression of a set of target mitochondrial proteins: PGK1/2, H6PD, NDUFV, and SDHC. The goal of the current study was to determine whether this correlation is maintained when two critical biological variables, sex and age, are manipulated by quantifying target protein levels throughout different age groups (3-24 months) for both sexes of wildtype (WT) and 3xTg-AD mouse model using Western blot and quantitative densitometry analysis. The changes in oxidative phosphorylation and glycolysis related protein targets were hypothesized to be dependent on neuroinflammation-induced miR-146a and 34a levels. The results indicate that age and sex are potential determining factors in the application of disease-modifying therapeutic targets for AD.

### Health Sci Poster 4:

#### **Differentiating the pathway of IL-6 production in astrocytes and macrophages in regard to the JAK1 protein**

Nina Bidwai, Emily Plyler, and Gordon Meares

*Departments of Biology, Neurobiology and Anatomy, and Microbiology, Immunology, and Cell Biology, West Virginia University, Morgantown, WV 26506*

Interleukin 6 (IL-6) is an acute phase cytokine that is necessary for innate and adaptive immunity, but is abnormal in disease conditions. This work focuses on understanding the molecular mechanisms leading IL-6 production, under specific disease conditions such as endoplasmic reticulum (ER) stress. Endoplasmic reticulum stress results from unfolded proteins that accumulate in the ER lumen. The resulting unfolded protein response causes expression of certain inflammatory factors, including IL-6. The over-expression of these inflammatory molecules is a major factor in neurodegenerative diseases, like multiple sclerosis. In this study, we exposed macrophages and astrocytes to ER stress inducing agents like tunicamycin and thapsigargin, with a goal to identify if IL-6 production is JAK1 dependent in both cell types. Using small molecule kinase inhibitors and small interfering RNA (siRNA) molecules, we identified that IL-6 requires PERK and JAK1 but not IRE1 in astrocytes. In contrast, we have observed IL-6 and other inflammation factors even with a JAK siRNA knockdown in the macrophages. The results indicate that the mechanisms for IL-6 production differ between macrophages and astrocytes.

## Health Sciences Category

### Health Sci Poster 5:

#### **Identification of pyrolytic products of drugs of abuse**

Derik McCarthy, Suzanne Bell, and Stephen Raso

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Overdoses due to heroin, fentanyl and alpha-PVP have increased in recent years. Several modes of ingestion are utilized, but when inhaled, increased risk to users may arise. Several reports in the literature have linked brain encephalopathy to heroin inhalation, suggesting the unique pyrolytic products of heroin could be the contributing factor. Recently, heroin has been found to be cut with fentanyl, which may alter this pyrolysis. A trending “bath salt”, alpha-PVP, is also inhaled and has caused recent deaths. These parent compounds thermally degrade into pyrolytic products of unknown toxicities that differ from the typical metabolites. Identification of these products is crucial to move forward with toxicity analysis. A previously developed combustion apparatus was utilized to pyrolyze heroin, fentanyl, and alpha-PVP. Samples were collected via methanolic extraction, evaporated over nitrogen and reconstituted for analysis using gas chromatography/mass spectrometry. The identification of observed products was confirmed with reference standards where available, and any remaining products were tentatively identified via a NIST library search. Approximately 2-3 products have been confirmed and 4-5 tentatively identified for each compound.

### Health Sci Poster 6:

#### **Comparative investigation of a novel chemotherapy for brain metastases of breast cancer**

Rachel Tallman, Neal Shah, and Paul Lockman

*Department of Pharmaceutical Science, West Virginia University, Morgantown, WV 26508*

Breast cancer is the second most common source of brain metastases. These are among the most difficult to treat because many chemotherapies cannot penetrate the blood-brain barrier (BBB), which acts as a filter that prevents toxins from entering. Consequently, there has been a push for medications that can cross the BBB and infiltrate brain tumors. In this study, a new chemotherapy called NKTR-102 was compared to conventional treatments for breast metastases to the brain, including gemcitabine, vinorelbine, docetaxel, and eribuline. Female athymic Nu/Nu mice were injected with 4T1 or 231Br-Luc breast cancer cells and administered one of the therapies upon brain tumor formation. Treatments were evaluated based on survival and brain imaging. Gemcitabine had most significant tumor burden restriction and survival for groups injected with 4T1 cells ( $p < 0.0001$ ), while NKTR-102 was most effective in treating metastases of 231Br-Luc cells ( $p < 0.0001$ ). This suggests that treatments may have differential effects based on the genetic makeup of the cells of the tumor, highlighting the importance of personalized medication.

## Health Sciences Category

### Health Sci Poster 7:

#### **Adipose progenitor cell expression of IL-6 and IL-6R in the breast tumor microenvironment**

Eric Lundstrom, Nicole Werwie, Kelsey Sadlek, David Runyon, and Linda Vona-Davis

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In recent years, studies have implied that an overabundance of fat tissue causes pre-existing breast tumors to become more malignant and aggressive. This has led to a focus on cytokine communication between tumor and non-tumor cells in the breast tumor microenvironment. In our lab's previous studies, the pro-inflammatory cytokine IL-6 has been found to be upregulated when mesenchymal stem cells (MSCs) are co-cultured with breast tumor cells. In this study, we quantitatively measured IL-6 and IL-6 receptor (IL-6R) in MSCs and preadipocytes derived from both bone marrow and adipose tissue in the presence of breast tumor cells (MDA MB 231). IL-6 and IL-6R concentrations in the conditioned media were measured using an ELISA assay. In addition, we performed a clinical analysis of IL-6 and IL-6 receptor expression using the cBioPortal, an open-source cancer genomics database. We found that IL-6 and IL-6 receptor did not have a significant impact on survival when examining all breast cancer subtypes collectively. However, IL-6 receptor expression is significantly increased in triple negative breast cancers compared to other subtypes.

### Health Sci Poster 8:

#### **Effects of a telenutrition program on diet quality and caloric intake in men**

Margaret A. Drazba and Melissa Marra

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Nearly 75% of men in West Virginia are overweight or obese. If not addressed, the consequences of obesity put them at increased risk for multiple chronic conditions. Reducing caloric intake and improving overall diet quality have shown to be beneficial in reducing weight and other chronic disease-associated risk factors. We used a randomized controlled trial design to evaluate the effect of a home telenutrition program on diet quality and caloric intake. Sixty obese men at risk for cardiovascular disease were recruited from primary care physician's offices. Participants were randomly assigned to telenutrition or usual care groups. Body weight was measured, and four 24-hour food records collected at weeks 0, 6, and 12. Nutrient analysis was performed using Nutrition Data System for Research and transformed to Healthy Eating Index 2010 diet quality scores. Means of the continuous outcome measures (diet quality scores and caloric intake) will be modeled over the three time points (0, 6, and 12 weeks) and interactions between time and intervention group will be tested via linear mixed models to assess for effectiveness.



## Health Sciences Category

### Health Sci Poster 9:

#### **Incorporation of benzalkonium chloride to improve the antimicrobial properties of lignocellulosic material**

Oliver Lin<sup>1</sup>, Gloria Oporto<sup>1</sup>, and Jacek Jaczynski<sup>2</sup>

<sup>1</sup>*Division of Forestry and Natural Resource and* <sup>2</sup>*Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26506*

TEMPO nanofibrillated cellulose (TNFC), carboxymethyl cellulose (CMC), and lignin were applied as nanoscale carrier molecules for benzalkonium chloride (BZK), a well-known organic biocide. The resulting hybrid suspension was analyzed for biocidal activity against *Escherichia coli* (*E. coli*) and dried for scanning electron microscopy analysis using a solvent exchange and freeze drying technique. The results indicate that there is slow release of BZK in suspension, which is desirable for long-term antimicrobial activity. Instant biocidal activity can be achieved with a minimal inhibitory concentration of 0.116 M BZK-TNFC hybrid suspension. Lignin and CMC used in complex with BZK to create a 0.046 M BZK-Lignin and 0.046 M BZK-CMC suspension demonstrated increased antimicrobial activity with longer exposure times. Initial concentrations of *E. coli* were  $3.1 \times 10^{-6}$  and  $0.5 \times 10^{-6}$ , while 24 hour exposure at 37° C resulted in complete inhibition of bacteria.

### Health Sci Poster 10:

#### **Willingness of academic physicians to complete an implicit association test**

Whitney P. Horton, Leigh Pratt, Scott Cottrell, Norman D. Ferrari III, and Linda S. Nield

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Implicit bias is considered a credible contributor to health care disparities. It is assumed that physicians' well-ingrained, unconscious stereotypes about certain groups lead to unintentional differences in the delivery of their health care. In this study, we seek to determine the factors that are associated with a physician's willingness to complete an implicit association test (IAT), a validated tool that measures implicit bias. An IRB-approved survey of twelve questions was emailed to residents, fellows, and faculty at the West Virginia University School of Medicine. The anonymous responses examined participants' social demographics, medical sub-specialty, basic knowledge of implicit bias, past completion of an IAT, and willingness to complete a future IAT. Data are currently being collected. We predict that the majority of physicians will not be receptive to the concept of implicit bias and will be uncertain of the value of completing an IAT. Identifying factors that influence a physician's willingness to complete an IAT may allow us to aim education towards those physicians who are unwilling to participate.

## Health Sciences Category

### Health Sci Poster 11:

#### **Inhibitory effects of curcumin on *Gardnerella vaginalis* biofilm**

Tyler S. Wanstreet and Rajesh K. Naz

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Biofilms are medically important, accounting for over 80% of microbial infections in the body. Bacteria protected within biofilms are up to one-thousand times more resistant to antibiotics than planktonic bacteria. Biofilms have been observed in women with vaginal infections. *Gardnerella vaginalis* (GV) is the major microbe involved in bacterial vaginosis (BV), which is a serious health problem in the clinics attributed to biofilm development. Curcumin, a diferuloylmethane, has immense properties, including anticancer and anti-inflammatory activities, without any side effects. The present study was conducted to examine the hypothesis that it has an anti-biofilm activity against biofilm developed by GV. The culture conditions were standardized to grow GV in agar (chocolate blood) and broth (brain heart infusion supplemented with 0.3% starch and 0.3% glucose), and for the development of biofilms. The biofilms were grown with and without curcumin in microtiter plates (MTP), and quantified by using crystal violet. Curcumin effectively inhibited the biofilm development in a concentration-dependent manner. The findings may have clinical implications in treating women with vaginal infections.

### Health Sci Poster 12:

#### **High fructose corn syrup-55 consumption changes hypothalamic AGRP gene expression in female Sprague-Dawley rats**

Sundus S. Lateef<sup>1,2</sup>, Kaitlin Mock<sup>2,4</sup>, Vagner A. Benedito<sup>3</sup> and Janet C. Tou<sup>2</sup>

<sup>1</sup>C. Eugene Bennett Department of Chemistry, <sup>2</sup>Division of Animal and Nutritional Sciences, <sup>3</sup>Genetics and Developmental Biology Program, Division of Plant and Soil Sciences, and <sup>4</sup>Department of Surgery, WVU Medicine, West Virginia University, Morgantown, WV 26506

Caloric sugar intake may impact signaling in the brain, resulting in weight gain and risk of obesity. This study investigated whether the higher fructose content in high fructose corn syrup-55 (HFCS-55) can affect brain regulation of food intake. Caloric sweeteners (sucrose, fructose or HFCS-55) were administered to healthy growing rats for 8 weeks at 13% w/v, the level typically found in sugar-sweetened beverages. Markers of lipogenesis (fat synthesis) and appetite in the hypothalamus were measured using real time quantitative polymerase chain reactions. Transcription factors (SREBP-1c, p=0.11) and enzymes (SCD-1, p=0.76; FAS, p=0.75) associated with de novo lipogenesis were not different among treatments. NPY (increases food intake) and POMC (decreases food intake) showed no differences among the sugar treatment groups (p=0.15 and p=0.65, respectively). AGRP, a neuropeptide that increases food intake, had 23% less gene expression in the HFCS-55 group compared to rats drinking water (p=0.04). The HFCS-55 and sucrose groups also had the highest caloric intake. This research suggests differences in hypothalamic regulation of food intake depended on the type of caloric sweetener.

## Health Sciences Category

### Health Sci Poster 13:

#### **Inhibition of glioblastoma multiforme tumors following exposure to a propanil analog**

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Glioblastoma multiforme (GBM) are stage IV brain tumors for which there is no curative treatment. GBM depend upon  $\text{Ca}^{2+}$ -release activated  $\text{Ca}^{2+}$  (CRAC) channels for migration, proliferation, the stability of various proteins, and survival. N-(3,4-dichlorophenyl)-N-methylpropanamide (NMDCPA) has been shown to block CRAC channels in vitro. The effect of NMDCPA on proliferation and migration of the U251MG glioblastoma cell line was determined using MTT and a Transwell assay. NMDCPA (12.5  $\mu\text{M}$  to 800  $\mu\text{M}$ ) inhibited proliferation in a dose-dependent manner by 1.8% to 98.6%. Migration was also inhibited in a dose-dependent manner (50 $\mu\text{M}$  to 200 $\mu\text{M}$  NMDCPA) by 12% to 48%. Previous work from our lab indicates that CRAC channel blockers may be effective due to hypoxia-inducible factor 1alpha (HIF-1 $\alpha$ ) inhibition. HIF-1 $\alpha$  plays a role in nearly all of GBM's most dangerous characteristics: proliferation, migration, and vascularity. In future work, immunoblotting assays will be used to determine whether NMDCPA decreases HIF-1 $\alpha$  protein expression. If it is found to do so, NMDCPA may have a future role in the treatment of glioblastoma multiforme.

### Health Sci Poster 14:

#### **Identifying differential gene expression in cytotoxic T cells induced by B16F0 melanoma exosomes**

Cassidy L. Bland<sup>1</sup>, Christina N. Byrne-Hoffman<sup>2</sup>, and David J. Klinken II<sup>1,2</sup>

<sup>1</sup>*Department of Chemical and Biomedical Engineering and Mary Babb Randolph Cancer Center and*  
<sup>2</sup>*Department of Microbiology, Immunology, & Cell Biology, West Virginia University, Morgantown, WV 26506*

Recent clinical studies demonstrate how engaging a patient's own immune system can be an effective tool in the fight against cancer. Yet, a barrier for broadening the clinical benefit of immunotherapy is identifying how tumors suppress the ability of immune cells to kill malignant cells. An important emerging mode for cellular cross talk is exosomes, which are nanoscaled particles secreted by tumors that carry proteins and RNA. To better understand how tumor-derived exosomes can alter immune cell function, this study investigated the effects of tumor exosomes on cytotoxic T cells. Specifically, we quantified how exosomes from B16F0 melanoma cells altered gene expression over time within CTLL2 cells, a mouse cytotoxic T cell line. Changes in mRNA over time was analyzed by RNA sequencing. Pathway enrichment algorithms were used to identify how B16F0-derived exosomes alter the function of cytotoxic T cells.

## Health Sciences Category

### Health Sci Poster 15:

#### **Functional redundancy of OVOL and GRHL genes in the suppression of the epithelial-to-mesenchymal transition (EMT)**

Joseph A. McGuire, Elizabeth Duarte, James T. Boothe, James H. Fugett, and Alexey V. Ivanov

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About 90% of cancers are of epithelial origin, and metastasis is the main cause of cancer related deaths. OVOL and GRHL family transcription factors are expressed in epithelial tissues and regulate the epithelial-to-mesenchymal transition (EMT), which is the process epithelial cells utilize to metastasize in cancer. We have previously shown that overexpression of individual OVOL or GRHL genes in mesenchymal cells inhibits EMT by repressing a major EMT inducer ZEB1. However, the exact functions and hierarchy of these genes in the maintenance of cell epithelial state are not well understood. To address this, we used the CRISPR/Cas9 system to generate knockouts of OVOL and GRHL family members in epithelial MCF7 cells. We found that knocking out individual OVOL or GRHL gene is not sufficient to induce an EMT. These results indicate that OVOLs and GRHLs are functionally redundant in the maintenance of cell epithelial state. We are currently generating sequential (double/triple/quadruple) knockouts that will allow us to determine if deletion of OVOL1&2 and/or GRHL1&2 will be sufficient to reactivate ZEB1 and induce EMT.

### Health Sci Poster 16:

#### **Total brain lipid extract peroxidation kinetics**

Timothy M. Ferrebee, Albert W. Pilkington III, and Justin Legleiter

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Lipid peroxidation is a possible modifying factor of beta-amyloid fibril formation, a process in which beta-amyloid fibrils form into oligomers and eventually plaques, a hallmark of Alzheimer's disease. However, the kinetics of total brain lipid extract (TBLE) peroxidation must first be found to control for them during beta-amyloid fibril lipid peroxidation experiments. We combined different concentrations of H<sub>2</sub>O<sub>2</sub> with TBLE and extracted samples every hour for 6 hours to measure the lipid hydroperoxide (LPO) concentration versus an LPO standard curve. The LPO reacts with ferrous ions through a redox reaction producing Fe(SCN)<sub>5</sub><sup>2-</sup> which can be related to concentration through measurement of absorbance at 500 nm. The first set of results indicated we were below the standard curve, so we made adjustments and the second set of results indicated we were above the standard curve. Once we get the extract to be within the concentration range of the standards, we will be able to discover the kinetics for use in beta-amyloid fibril formation experiments as a possible target for Alzheimer's disease.

## Health Sciences Category

### Health Sci Poster 17:

#### **Donor-specific comparison of trilineage potential of mesenchymal stem cells**

Hunter Snoderly,<sup>1,2</sup> Tyler Pizzute,<sup>1,3</sup> Shanawar Waris,<sup>1,2</sup> Karlee Lobban,<sup>1,2</sup> Zach Werner,<sup>1,4</sup> and Ming Pei<sup>1,2,5</sup>.

<sup>1</sup>*Stem Cell and Tissue Engineering Laboratory, Department of Orthopedics,* <sup>2</sup>*Department of Chemical and Biomedical Engineering,* <sup>3</sup>*Exercise Physiology,* <sup>4</sup>*School of Medicine, and* <sup>5</sup>*Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, West Virginia 26506*

Mesenchymal stem cells (MSCs) offer treatment to many conditions, particularly in orthopaedic applications involving adipose, bone, and cartilage tissue regeneration. Donor-specific discrepancies between various MSC populations, especially synovium derived stem cells (SDSCs) and adipose derived stem cells (ADSCs), have not been well characterized. This study seeks to better define such differences by isolating SDSCs and ADSCs from rabbits (n=4). Samples were cultured and passaged several times, followed by tri-lineage differentiation in a pellet culture system, using osteogenic, adipogenic, and chondrogenic media for each cell type in vitro. Preliminary findings indicate ADSCs showed enhanced proliferation compared to SDSCs, with rabbits 3 and 4 exhibiting superior monolayer proliferation during initial expansion. As expected, ADSCs produced chondrogenic pellets that were much smaller than SDSC pellets. Following differentiation, histological staining and RT-PCR were used to evaluate successful differentiation and gene expression for chondrogenic and adipogenic genes, respectively. Current data show dissimilarities in quality and differentiation capacity in MSCs donors, despite identical culture conditions. This emphasizes the importance of donor-specific considerations regarding future therapeutic applications of MSC differentiation.

### Health Sci Poster 18:

#### **Neural networking for marking the offset of ground reaction forces during rat gait**

Adam Chivers<sup>1</sup>, Kiril Tuntevski<sup>1,3</sup>, and Sergiy Yakovenko<sup>2,3</sup>

<sup>1</sup>*Department of Chemical and Biomedical Engineering,* <sup>2</sup>*Center for Neuroscience and* <sup>3</sup>*Exercise Physiology, West Virginia University, Morgantown, WV 26506*

Locomotor ability is closely associated with the quality of life in stroke survivors, and its rehabilitation relies on understanding healthy and disrupted gait patterns. For this purpose, we analyze ground reaction forces (GRF), in rats before and after ischemic stroke. Manual analysis of swing and stance step phases characterizing locomotion patterns is time consuming. We developed a two-layer feed-forward neural network (NN), which utilizes Levenberg-Marquardt back propagation, consisting of a hidden layer with 10 sigmoid neurons and a linear output layer to mark the unloading in GRF associated with the onset of flexor (swing-related) muscle activity. Variable number of GRF profiles with manually marked events trained the NN until the simulations were optimized. Validation data was used to determine when the NN converged optimally. Preliminary results show that the NN can calculate unloading events with high precision (root mean squared errors 1e-8 s). The transition to saturated optimal performance occurred at about 1000 training samples. The current method may be further extended to the analysis of muscle activity in both animal and human locomotion.

## Health Sciences Category

### Health Sci Poster 19:

#### **Descriptive investigation of risk factors associated with urological cancer**

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*Department of Surgery, Robert C. Byrd Health Science Center, West Virginia University, Morgantown,  
WV 26506*

Urological cancer is a prevalent disease that includes the bladder, kidney, prostate and testicle. The rate of urological cancer cases is astounding, nearing 683,000 new cases per year. Discovering specific risk factors for urological cancer would be most beneficial to prevent urological cancer development. The pilot study investigated specific trends of urological cancer patients in West Virginia by conducting comprehensive surveys. The data was then compared with recent health statistics of West Virginia. The results offered valuable insight into risk factors for urological cancer. Of the 508 men who completed the survey at the West Virginia University Urology Clinic, 180 reported to have a current or past history of cancer. Of the 180, 125 (69.4%) currently use tobacco. As of 2015, the current rate for smoking tobacco in the state is 26.7%. A quantitative description of male, urological cancer patients is described herein. Future research includes further investigation of discrepancies between population with cancer and state population.

## Nanoscience Category

### Nanoscience Category Index:

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**Rainor Connor**, Robbyn Trappen & Mikel Holcomb.

**Poster 2:** *Biomolecular interactions with nanoparticles: quantifying  $17\beta$ -estradiol binding affinity to titanium dioxide nanoparticles.* **Annika L. Schroder**, Marriah C. Ellington & Lisa A. Holland.

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## Nanoscience Category

### Nanoscience Poster 1:

#### **Classifying high quality magnetic La(0.7)Sr(0.3)MnO<sub>3</sub> thin films**

Rainor Connor, Robbyn Trappen, and Mickel Holcomb

*Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506*

Magnetic materials have long been a part of modern technology. While there is a wide range of magnetic materials capable of being used in the micro-scale, nearly all ferro-magnetic materials lose their properties at the nano-scale and the theory is still out as to why this phenomenon occurs. Our goal is to use Lanthanum Strontium Manganate (LSMO) for two studies; first to determine exactly what parameters of the deposition process of these nano-scale films create stronger or weaker magnets (oxygen pressure, temperature, and growth rate). Second is to determine if an in situ method of analysis, reflection high energy electron diffraction (RHEED), can be used to monitor in real time the very effects that cause these changes in magnetization. While RHEED has been used widely to monitor unit cell growth, a primary goal is for the system to be capable of determining physical properties such as lattice strain and possibly lattice consistency. Our findings open a route to determine what will create quality thin films that future devices will require to continue our advancement towards superior technology.

### Nanoscience Poster 2:

#### **Biomolecular interactions with nanoparticles: quantifying 17 $\beta$ -estradiol binding affinity to titanium dioxide nanoparticles**

Annika L. Schroder, Marriah C. Ellington, and Lisa A. Holland

*C. Eugene Bennett Department of Chemistry, West Virginia University,  
Morgantown, WV 26506*

The health effects that nanoparticles pose are uncertain due to their spontaneous biofilm accumulation that may lead to the binding and delivery of contaminants to the rest of the body. Titanium dioxide nanoparticles are found in a large amount of commercial products, including sunscreens and toothpastes. The purpose of this research is to better understand and quantify the differing binding affinities of titanium dioxide to the estrogenic steroid 17 $\beta$ -estradiol when altering its matrix. By using a pH-mediated stacking capillary electrophoresis technique, nanomolar concentrations of 17 $\beta$ -estradiol have been quantified and used to understand the binding patterns of titanium dioxide to various proteins and to the estrogenic hormone. This study indicates that that the protein matrix fetal bovine serum effectively binds to estradiol when it forms a corona on titanium dioxide nanoparticles. The composition of the protein corona affects the amount of estradiol that binds to the nanoparticles. The differences in the structures and complexities of these protein matrixes are vital in understanding their effect on binding between titanium dioxide nanoparticles and 17 $\beta$ -estradiol.



## Nanoscience Category

### Nanoscience Poster 3:

#### **Fabrication of hierarchical nanostructures for surface-enhanced Raman scattering biosensors**

Kathrine Curtin<sup>1</sup>, Sujan Kasani<sup>2</sup>, Peng Zheng<sup>1</sup>, and Nianqiang Wu<sup>1</sup>

<sup>1</sup>*Department of Mechanical and Aerospace Engineering and* <sup>2</sup>*Lane Department of Computing and Electrical Engineering, West Virginia University, Morgantown, WV 26506*

Biosensors are novel devices for offering fast, point of care results in healthcare fields. Nanostructures can improve the performance of biosensors. For example, plasmonic gold nanohole arrays have been demonstrated to amplify the surface-enhanced Raman scattering (SERS) signal in biosensors because of their unique optical properties and highly tunable localized surface plasmon resonance (LSPR). However, it remains a challenge to fabricate nanostructures such as nanohole arrays. Herein a gold nanohole array-silica spacer-gold nanodisk array has been fabricated based on nanosphere lithography. The SERS effect is considerably improved due to the plasmonic coupling between the gold nanohole array and the nanodisk array separated by a small silica gap (~10 nm). Ultraviolet-visible spectroscopy, Raman spectroscopy, and finite-difference time domain simulations have been used to characterize the performance. The plasmonic nanostructure obtained can be potentially integrated into microfluidic devices for healthcare and environmental monitoring.

### Nanoscience Poster 4:

#### **Growth and structural characterization of iron fluoride**

Becca Davis<sup>1</sup>, Amit KC<sup>2</sup>, Toyannath Joshi<sup>2</sup>, Pavel Borisov<sup>2</sup>, and David Lederman<sup>2</sup>

<sup>1</sup>*West Virginia Wesleyan College and* <sup>2</sup>*West Virginia University, Morgantown, WV 26506*

My goal was to successfully synthesize epitaxial Iron Fluoride films of two different crystalline orientations, with a thickness ranging between 40nm to 60nm and a mean film roughness of less than 1nm. These objectives had to be met in order for the films to be forwarded to Rutgers University for further research, related to novel designs of electric batteries made of the advanced new material Iron Fluoride. This research will aid in the advancement of battery applications to allow for more efficient charge transport. (110) and (001) oriented Iron Fluoride films were grown on Magnesium Fluoride substrates via Molecular Beam Epitaxy (MBE) technique. Reflection high energy electron diffraction (RHEED) was used for in-situ characterization of thin film and single crystal substrate surfaces. X-ray diffraction (XRD) and x-ray reflectometry (XRR) were also used to characterize the thin films in terms of crystal structure, film thickness and roughness. The smallest mean film roughness for each sample included (001) with 1.764nm and (110) with 0.999nm. Future endeavors would include growing more samples with a roughness under 1nm.

## Nanoscience Category

### Nanoscience Poster 5:

#### **Enzyme-based conjugates capable of bacterial decontamination**

Melanie Hott, Andrew Maloney, and Cerasela Zoica Dinu

*Department of Chemical and Biomedical Engineering, West Virginia University, Morgantown, WV 26505*

Surfaces in hospitals and medical clinics can easily become contaminated with bacterial species that can rapidly spread, potentially causing infections. This is a serious health concern that medical establishments need to combat on a daily basis. Despite efforts to reduce the spread of bacteria through sterilization methods with harsh chemicals, there is no guarantee that all bacteria are killed in real time. Herein, the development of a coating containing an active decontaminating species is proposed. The coating is based upon the integration of bio-nano conjugates, comprised of a system of enzymes bound to nanosupports, into paints. The enzymes, glucose oxidase and chloroperoxidase, were bound physically and covalently, respectively to multiwall carbon nanotubes to increase the coating's functionality. The surface chemistry and morphology of the conjugates were observed as well as the loading and activity of the enzymes upon immobilization. Activity was reported with respect to the free enzyme via colorimetric assays. Preliminary results suggest that the conjugate system generates the active decontaminant (hypochlorous acid) in concentrations that would be suitable for bacterial decontamination.

### Nanoscience Poster 6:

#### **Evaluating cellular damage initiated by carbon nanofibers using micronuclei analysis**

Jenny L. Bundy, Constance A. Mitchell, Katelyn J. Siegrist, David Lowry, Michael Kashon, Steven H. Reynolds, and Linda M. Sargent

*National Institute of Occupational Safety and Health, Morgantown, WV 26505*

Carbon nanofibers (CNFs) represent an innovative alternative for various material and technological applications. The International Agency for the Review of Carcinogens has recently classified Mitsui-7 multi-walled carbon nanotubes (CNT) as a class 2B carcinogen. CNTs and CNFs have similar fiber-like shape and rigidity. Therefore, CNFs may pose significant health threats, such as adenocarcinoma and mesothelioma, to industrial workers. Immortalized and primary human lung epithelial cells were exposed to four types of CNFs at occupationally-relevant doses, 24, 2.4, 0.24, and 0.024  $\mu\text{g}/\text{mL}$ . Cytotoxicity was analyzed in both cell types using alamarBlue assay. DNA damage was evaluated in the immortalized cell type by micronuclei stained with pancentromere probe to distinguish between clastogenic and aneugenic effects. Preliminary results show an increase in cytotoxicity with exposure to all CNFs in both cell types. It is anticipated that CNF treatment will induce micronuclei formation in a dose-dependent manner. These data indicate that CNFs have similar toxic effects as CNTs; therefore, exposure to these nanomaterials should be cautioned.

## Nanoscience Category

### Nanoscience Poster 7:

#### **Quantification of the effect of carbon nanotube carboxylation on the peptide binding affinity to understand toxicity**

Shannon M. Patberg, Tyler Davis, and Lisa Holland

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Carbon nanotubes are widely used in manufacturing as reinforced polymers and plastic composites. Yet, carbon nanotubes are insoluble in the aqueous solutions required for formation of composites until modification or functionalization. Acid washing is used to render carbon nanotubes soluble because it increases carboxylation. Literature studies of the toxicity of acid washed carbon nanotubes are limited; however, it is postulated that acid washing decreases toxicity. It is important to characterize the toxicity of carbon nanotubes to ensure safe handling. Different acid washing techniques result in different carbon nanotube products. To characterize these carbon nanotubes an innovative analytical technique is utilized to quantify the effect of acid washing conditions on the molecular binding affinity to a model peptide. This method uses capillary electrophoresis to monitor the changes in the charge-to-size ratio of the peptide-carbon nanotube complex in an electric field. The results obtained using capillary electrophoresis reveal that affinity for the peptide increases with carboxylation. This enabling tool can be used to characterize toxicity and elucidate molecular mechanisms relevant to physiological systems exposed to carbon nanotubes.

### Nanoscience Poster 8:

#### **Toxicity of copper sulfate and cellulosic copper nanoparticles for use in hybrid metal antifungal treatments**

Vincent A. Pilolli<sup>1</sup> and Jennifer Gallagher<sup>2</sup>

*<sup>1</sup>Department of Biological Sciences and Chemical Engineering, Youngstown State University, Youngstown, OH 44555 and <sup>2</sup>Department of Biology, Eberly College of Arts and Sciences, West Virginia University, Morgantown, WV 26506*

Pathogens threaten human health, but unlike bacteria both fungi and humans share similar molecular structures making it hard to find an effective antifungal treatment without harmful drug side effects. Copper's intrinsic toxicity has been utilized for thousands of years to control microbes. *Saccharomyces cerevisiae*, budding yeast, was used as a model organism to investigate methods to improve copper delivery to inhibit fungi because of their simplicity to grow in the lab and tremendous genetic diversity. Low cost biodegradable nanomaterials built on cellulose, known as cellulosic cupric nanoparticle or c-CuNPs, deliver copper in a controlled manner. Qualitative and quantitative analysis show that c-CuNPs are more effective at lower concentrations than copper sulfate. Previous studies measured changes in whole cell proteomics in response to copper using a copper resistant and sensitive strain. Copper resistant strains increased expression of zinc transporters. Increasing amount zinc were added to c-CuNP to optimize cell growth inhibition. The effectiveness of cellulosic copper nanoparticles against microbial organisms was measured by using *S. cerevisiae* to understand how cells respond to metallic hybrid nanomaterials to improve antimicrobial nanomaterial targeting for other eukaryotic pathogens.

## Nanoscience Category

### Nanoscience Poster 9:

#### **Synthetic pathway for the formation of homogenous carbon nanohoops**

Dakota Winter Burdette, Behzad Farajidizaji, and Kung K. Wang

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV, 26506*

The synthesis of cycloparaphenylenes, or more commonly known as carbon nanohoops, has been of interest in recent years due to their possessing unique characteristics such as thermal conductivity and electrochemical as well as electro-optical properties that make them ideal for industrial use, such as in electronics, optics, and carbon fiber. The problem with current synthetic pathways is the lack of uniformity of the self-building carbon nanotubes off of the carbon nanohoops. In this study, a new synthetic pathway for a homogenous carbon nanohoop was devised and followed. The pathway makes use of platinum-homocoupling, as platinum has been shown in previous studies to self-assemble into a square-planar structure, and is able to be reductively eliminated under certain conditions.

### Nanoscience Poster 10:

#### **Free radical generation and cytotoxicity of zinc oxide and zinc nanoparticles**

Kylie E. Shockley<sup>1</sup>, Anna M. Morris<sup>2</sup>, Nicole S. Olgun<sup>2</sup>, and Stephen S. Leonard<sup>2</sup>

*<sup>1</sup>West Virginia Wesleyan College and <sup>2</sup>National Institute for Occupational Health and Safety, Morgantown, WV 26505*

Zinc and zinc oxide nanoparticles are commonly used in manufacturing processes for many products, including ceramics, rubber, sunscreen and cosmetics. Workers exposed to nanoparticles during these processes are at risk of inhalation and any resulting adverse effects. Previous preliminary studies conducted indicate possible cytotoxicity. This study investigated the toxicity of zinc nano, zinc oxide nano, and zinc oxide micro particles. Particles were characterized using X-ray diffraction and microscopy, as well as SEM and TEM. Cytotoxicity was assessed by evaluating cell viability using a CellTiter assay, membrane damage measuring lactate dehydrogenase release, free radical generation via electron paramagnetic resonance and production of intracellular reactive oxygen species through the use of DCFH staining, DNA damage with a Comet assay, and activation of inflammatory cytokines determined by ELISA. All particles displayed differing types and intensities of cytotoxicity, with zinc nanoparticles having the most consistent detrimental effect and the only particle to generate free radicals.

## Nanoscience Category

### Nanoscience Poster 11:

#### **Optical imaging of dipole ordering in nickelate polar metal**

Jordan D. Sosa, Cen Cheng, and Ming Yang

*Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506*

NdNiO<sub>3</sub> (or NNO) is a material with a rare set of properties that can allow for more efficient data storage and solar energy harvesting. At high temperatures, it is a conductor; but at low temperatures, it acts as an antiferromagnetic insulator, a characteristic involving organized magnetic moments that makes this material so unique. Despite the large free carrier density at room temperature, NNO also exhibits a rare spontaneous electric polarization when grown on (111) LaAlO<sub>3</sub> substrate. This ability to be a conductor but also have a polarization under certain conditions is another reason for investigating this material. We will use polarized microscopy and the photovoltaic effect to map out the polarization patterns as well as their potential interactions with magnetic ordering. Through such investigations, we hope to develop methods to manipulate the spontaneous polarization using magnetic fields or current in order to meet the rising demand in smaller electronic devices.

### Nanoscience Poster 12:

#### **Electrically enhancing calcium cobaltite using silver nanoparticles**

Megan Wilt, Cullen Boyle, and Xueyan Song

*Statler College of Engineering, West Virginia University, Morgantown, WV 26506*

Suspended Ag nanoparticles (NP's) were added to the calcium cobaltite, Ca<sub>3</sub>Co<sub>4</sub>O<sub>9</sub>, baseline and its electrical properties were analyzed. Two methods were used for comparison when adding the Ag nanoparticles. The Ag CCO samples were then compared to a baseline CCO sample with no Ag NP's. All samples were prepared using a sol-gel route. The Ag NP's were added dropwise into a stirring ethanol solution containing CCO. The power factor, a measure of the material's ability to convert heat to electricity, of the Ag NP sample was lower than the CCO baseline. The second method of nanoparticle preparation was the fabrication of the nanoparticles using a hydrothermal reaction. The hydrothermal process involved a reaction between silver nitrate, and ammonium hydroxide during certain conditions that prompted the fabrication of Ag NP's to be added into the CCO sample. Once the results from the hydrothermal process are collected, the two methods will be compared.

## Nanoscience Category

### Nanoscience Poster 13:

#### **Design and fabrication of a nanosphere photonic lattice**

McKenzie Windham<sup>1</sup>, Kyle Smith<sup>2</sup>, and Jeremy Dawson<sup>2</sup>

<sup>1</sup>*Department of Biological and Agricultural Engineering, Louisiana State University, Baton Rouge, LA 70816 and* <sup>2</sup>*Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26505*

Recently, demand for biosensors for applications such as home and portable diagnostics, biodetection/defense, etc. has increased, requiring increased development of component technologies enabling portability. One popular sensing modality is fluorescent spectroscopy, often performed on labelled analytes with a wavelength-specific fluorophore. The limit of detection is the minimum emitted light measurable by a detector. In response, plasmonic-based biosensors have been developed to increase fluorophore photon output, reducing the detection limit. Fabrication of plasmonic devices normally utilizes Electron Beam Lithography, which is highly accurate, but not cost effective for large-scale production. Nanosphere patterning, where nanospheres form a monolayer on substrate surface, is capable of producing similar features on a large-scale. A plasmonic nanosphere lattice was designed, including lattice constant values of 200nm, 350nm, and 500nm. A temperature-controlled nanosphere self-assembly method achieved monolayer wafer coverage. Best performance was determined by maximum electric field production and distribution. In order to achieve the critical dimensions determined by simulation, a plasma etch curve was developed. After gold deposition, we expect to see the device produce enhancement of one to two magnitudes.

## Physical Sciences Category

### ***Physical Sci Category Index:***

**Poster 1:** *Synthesis of luminescent zirconium (IV) complexes as molecular photosensitizers.*  
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**Poster 2:** *Characterization of a pulsed high temperature fast flow reactor for gas phase kinetics.*  
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**Poster 13:** *Simulating the thermodynamic properties of pH-low insertion peptide using molecular dynamics.* **Aleena Andrews**, Austin Clark & Blake Mertz.

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## Physical Sciences Category

**Poster 16:** *Measurement of argon neutral velocity distribution functions near an absorbing boundary in a plasma.* **Zachary D. Short**, Derek S. Thompson, Timothy N. Good & Earl E. Scime.



## Physical Sciences Category

### Physical Sci Poster 1:

#### **Synthesis of luminescent zirconium (IV) complexes as molecular photosensitizers**

Anne Belldina, Yu Zhang, and Carsten Milsmann

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Transition metal photosensitizers have become a topic of interest due to their potential applications in photovoltaic cells, solar fuels, and photoredox chemistry. Current photosensitizers are costly and use transition metals with low earth abundance. We chose to utilize zirconium because of its low cost and high earth abundance, making it a better candidate for large-scale applications. Zirconium complexes carrying 2,6-bis(pyrrolyl)pyridine ligands have been synthesized and characterized. By coupling a pyridine with pyrrolyl moieties, we have created redox active ligands that enhance the redox potential of the complex by creating a push/pull movement of electrons throughout the molecule. Unlike current photosensitizers, which employ electron rich metal centers, such as ruthenium and iridium, and electron withdrawing ligands to form a metal-to-ligand charge transfer (MLCT), our complexes employ an electron deficient metal center and electron withdrawing ligands that form a ligand-to-metal charge transfer (LMCT). We have developed a straightforward modular method of ligand synthesis that allows us to easily substitute substituents in order to tune and study the steric, optical, and electronic properties of the zirconium complex.

### Physical Sci Poster 2:

#### **Characterization of a pulsed high temperature fast flow reactor for gas phase kinetics**

Kathryn Hinkelman, Michael Spencer, James Lee, Kacee Caster,  
Juddha Thapa, Paul Orndorff, Zimo Fan, and Fabien Goulay.

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown,  
WV 26506*

Combustion is a common phenomenon with numerous applications including powering cars and cooking food. Within combustion, there exist radical-radical reactions and reactions between radicals and other molecules that are still not well understood. In order to investigate the reactivity of these radicals over various temperatures (300K-750K), a reactor capable of producing homogenous, high temperature gas flow is necessary. To ensure that these properties exist, spectroscopy and kinetic experiments were performed to characterize the gas flow. Temperature measurements were conducted by using laser photolysis to produce hydroxyl radicals and laser-induced fluorescence (LIF) from 279.00nm-281.00nm. At a set temperature of 400K, the gas flow was measured to be 380K. The reactivity of hydroxyl radicals and trans-butene was measured using LIF at 281.982nm. At 370K, the rate coefficient for this reaction was determined to be  $6.39(\pm 0.2) \times 10^{-11} \text{ cm}^3 \text{ s}^{-1}$ . Kinetic data was also taken at various pressures (2.8torr-5torr). The results indicate a pressure dependence. In the future, more experiments will be conducted to continue characterizing and improving the quality of the flow.

## Physical Sciences Category

### Physical Sci Poster 3:

#### **Single swab analysis for organics and inorganics present in gunshot residue**

Joseph A. Stein, Suzanne Bell, Kristin M. Kelly, William J. Feeney, and Lindsey Cheeseman

*Department of Forensic and Investigative Science and C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26505*

Traditionally, lead, barium and antimony are the elements targeted using a scanning electron microscope with an energy dispersive x-ray spectrometer (SEM-EDX) in gunshot residue (GSR). With lead free ammunition becoming more popular, new ways of analyzing GSR are necessary. This project aimed to develop a method to analyze a single swab for both organic and inorganic GSR. The ultimate goal was to successfully find a combination of organic and inorganic compounds that are only likely to exist on an individual who has handled a firearm. Subjects went to the West Virginia University Ballistics Research Facility and fired different pistols and ammunition. Swabs were taken from the hands of these individuals and placed in separate vials. The organic gunshot residue (OGSR) was extracted first and tested using a thermal desorption gas chromatogram mass spectrometer (GC-MS). The inorganics were then extracted and tested using an inductively coupled plasma mass spectrometer (ICP-MS). The results show that both the organics and inorganics could be detected within the parts per billion range.

### Physical Sci Poster 4:

#### **Synthesis of silver (I) complex intermediates**

Caitlin M. Embly, Aaron P. Honeycutt, and Jessica M. Hoover

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

The biaryl motif is an important structure found in many pharmaceutically active compounds. Transition-metal catalyzed oxidative decarboxylative coupling reactions are one potentially useful way of forming the C-C bond of biaryls because carboxylic acids are abundant and their use minimizes waste production and shows good atom-economy. The regioselectivity of the reaction arises from the position of the acid. Unfortunately, these reactions have traditionally been limited to benzoic acids bearing an *ortho*-nitro functional group. This limitation may be due to the 2-nitro group promoting the decarboxylation. To better understand the nitro groups role in silver-catalyzed decarboxylation reactions, a series of phenanthroline-chelated silver(I) benzoate complexes bearing various substituents and substitution patterns were synthesized to compare to the 2-nitro substituted complex. The series of new compounds were characterized both by <sup>1</sup>H NMR and IR spectroscopies. This poster discusses the synthesis and characterization of the Ag complexes, in addition to showing some preliminary data measuring the rates of their decarboxylation.

## Physical Sciences Category

### Physical Sci Poster 5:

#### **Mapping biexciton-polariton interactions in semiconductor microcavities**

Laura A. Kelley<sup>1,2</sup>, Brian Wilmer<sup>1</sup>, and Alan Bristow<sup>1</sup>

<sup>1</sup>*Department of Physics and* <sup>2</sup>*LANE Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown WV 26505*

Understanding the light-matter interaction in semiconductor microcavities is necessary in order to explore quantum phenomena for the future of photonic and quantum information devices. Two-dimensional coherent spectroscopy (2DCS) is a powerful technique for understanding the many-body interactions in real systems. Three 100fs, .3mW laser pulses excite a quantum microcavity held at low temperature, creating excited states which relax, emitting non-linear four wave mixing. One possible excited state is a biexciton (a doubly excited fundamental exciton). A clear biexciton feature is observed in co-circular polarization excitation which was not expected because of selection rules which indicate the state does not consist of paired up and down spin particles. The continuation of study into understanding how the biexciton interacts with other excited states in the system will lead to understanding the physics necessary to engineer a system utilizing these fundamental interactions.

### Physical Sci Poster 6:

#### **Luminescent zirconium (IV) complexes in photoredox catalysis**

Dylan Leary, Yu Zhang, and Carsten Milsmann

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Transition metal photocatalysts have been studied extensively in chemical research. Their employment in synthetic chemistry has greatly advanced the field, allowing for more mild reaction conditions and less complex synthetic strategies. In addition, these compounds have been used in photovoltaics and solar fuel production. Traditionally these catalysts employ precious metals such as rhodium, ruthenium, and iridium. Since these metals are rare, more abundant alternatives are necessary. Our group has previously synthesized photocatalysts utilizing zirconium, an earth abundant metal. They've been shown to be effective in various organic photoredox reactions, e.g. dehalogenation of  $\alpha$ -bromoesters. In this study, we've been attempting to examine the effects of electron-donating groups on the ligand framework. We've hypothesized these groups will allow us to fine-tune the electrochemical properties of the zirconium complexes. In addition, I've been working on a new application of the complexes in inorganic transformations, namely the reduction of  $^{iPr}PDICoCl_2$  to  $^{iPr}PDICoCl$ . Results have shown only trace amounts of product thus far, but we're confident the reaction conditions can be optimized to yield a useful amount of product.

## Physical Sciences Category

### Physical Sci Poster 7:

#### **A search for fast radio bursts in archival Green Bank Telescope drift scan data**

Anika Rowe, Maura McLaughlin, and Peter Gentile

*Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26505*

To date, there are only 17 cataloged fast radio bursts (FRBs), which are millisecond pulses of radio emission whose high dispersion measures (DM) for a given line of sight indicate that they originate from beyond the Milky Way. In this search, data from the Green Bank Telescope's 2007 drift scan survey at 350 MHz is undergoing re-processing for FRBs out to a DM of  $5000 \text{ pc cm}^{-3}$  via single-pulse search software; the resulting plots are being inspected manually. The cause of these bursts is unknown, but by adding to the catalog of previously detected FRBs through searches like this, we may elucidate the source type, whether it is a known periodic radio source such as a pulsar or magnetar (which the newly-discovered repeating FRB 121102 may suggest), a cataclysmic event, or a new class of neutron star. If an FRB is detected in the data, it will be the first detection below 800 MHz; if FRBs are absent, we will set new limits on the properties of these sources at low frequencies.

### Physical Sci Poster 8:

#### **Separation of amino acids by solid phase extraction (SPE) for use in forensic hair analysis**

Gabriel M. Walkup<sup>1</sup>, Sierra M. Stinson<sup>1</sup>, and Glen P. Jackson<sup>1,2</sup>

*<sup>1</sup>C. Eugene Bennet Department of Chemistry and <sup>2</sup>Department of Forensic and Investigative Science, West Virginia University, Morgantown, WV 26506*

Hair is important in forensic science because it is often found at crime scenes and can identify victims or suspects, such as with DNA profiling. Our group has demonstrated that the quantity and isotope ratios of amino acids in hair are related to biometric traits such as sex, age and body mass index. To measure the  $^{13}\text{C}/^{12}\text{C}$  isotope ratios of amino acids in hair, our group uses HPLC to separate the amino acids, but the IRMS detector dictates that organic solvents cannot be used in the mobile phase, as is typical, so the separation times are too long and contains co-eluting peaks. To improve the HPLC separation, we are developing a solid phase extraction (SPE) approach to divide the amino acids into two distinct groups. Each group of amino acids can then be analyzed independently under conditions better suited for their separation. Preliminary findings using thin layer chromatography (TLC) show that a two-step elution is somewhat effective in separating the amino acids into two groups, but some of the amino acids are not sufficiently collected.

## Physical Sciences Category

### Physical Sci Poster 9:

#### **Functionalizing vinyl arenes to produce new derivatives of non-steroidal anti-inflammatory pharmaceuticals**

Kayla Kroner, Trina Perrone, and Brian Popp

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Organic synthesis is important for the development of new pharmaceutical drug candidates. Current development techniques commonly rely on the use of precious metal catalyst systems, that generally suffer from cost and biocompatibility concerns. The scientific community is pushing for a move away from expensive precious metal systems, such as palladium and rhodium, to more abundantly available base metals, such as iron, nickel, and copper. We have recently developed a copper-catalyzed regioselective heterofunctionalization reaction that represents the first example of a boracarboxylation of a vinyl arene. For example, using para-tert-butyl styrene, a synthon for the NSAID ibuprofen, we have achieved yields greater than 85% on gram-scale of the boracarboxylation product. Our research seeks to develop new reactions of this boracarboxylation compound by C-H functionalization of the arene directed by the  $\alpha$ -aryl carboxylic acid or by Suzuki cross-coupling with a novel  $\beta$ -fluoroborate salt. Synthetic progress toward this goal is presented.

### Physical Sci Poster 10:

#### **Kinetic investigation of the OH radical reaction with cyclopentadiene**

Paul B. Orndorff, Kacee Caster, and Fabien Goulay

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

This study investigates the kinetics of the OH reaction with cyclopentadiene (CP,  $c\text{-C}_5\text{H}_6$ ). Measuring rate coefficients for radical reactions of organic compounds provides insight on the formation and growth of large molecules such as polycyclic aromatic hydrocarbons (PAHs). In combustion environments, PAHs are believed to be precursors to the soot formation process. In these experiments, the OH radical is generated by laser photolysis of  $\text{H}_2\text{O}_2$  at 266 nm, and its concentration monitored by laser-induced fluorescence (LIF). The first order rate expression at different concentrations provides the second order rate expression for the reaction through pseudo first order conditions. The radical reaction with CP was investigated at 300 K and 2.5 torr, and a  $k_{2\text{nd}}$  value of  $6.5 \times 10^{-11} \text{ s}^{-1} \text{ cm}^3$  was determined. These values suggest the reaction may proceed through hydrogen abstraction on the  $\text{sp}^3$  carbons forming the cyclopentadienyl radical. This is important since cyclopentadienyl may play an important role in the formation of PAHs and soot in the combustion environment. Investigation at higher temperatures remains important to better simulate a combustion setting.

## Physical Sciences Category

### Physical Sci Poster 11:

#### **Progress towards the total synthesis of tricyclic alkaloid Dilemmaone B**

Jeffrey McNeill, Katharine Lambson, and Björn Söderberg

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

In 1997, a group exploring the biomedical potential of South African marine invertebrates isolated three compounds from sponges found off the coast of Cape Town. Due to a number of interesting structural motifs including an indole core, and the small natural abundance of these compounds, the Söderberg group has suggested a total synthesis for one of these compounds, Dilemmaone B. Using a retrosynthetic approach, it has been proposed that Dilemmaone B can be accessed via a substituted indanone and its late-stage N-heterocyclization to create the indole core. Using both established and modified techniques, progress towards this compound has been made, and seven of the eleven proposed steps have been successfully carried out. Product formation in each step has been verified using  $^1\text{H-NMR}$ ,  $^{13}\text{C-NMR}$ , IR, and MS. Yields have been calculated, and are moderate to good for each reaction after optimization. Key future work includes a Sonogashira coupling reaction and an N-heterocyclization to access the final product.

### Physical Sci Poster 12:

#### **Do hygiene products cause false positives in arson investigations?**

Sierra M. Stinson<sup>1</sup>, Gabriel M. Walkup<sup>1</sup> and Glen P. Jackson<sup>1,2</sup>

*<sup>1</sup>C. Eugene Bennet Department of Chemistry and <sup>2</sup>Department of Forensic and Investigative Science, West Virginia University, Morgantown, WV 26506*

Arson investigators typically search for the presence of ignitable liquid residues (ILRs), such as gasoline, diesel, and kerosene, in fire debris samples collected from suspected arson scenes and suspects. Fire debris analysts typically use gas chromatography/mass spectrometry (GC/MS) data to analyze samples for compounds that are common in ILRs, such as aromatics, naphthalenes and straight chain, branched and cyclic alkanes. During an investigation, a suspect's clothing is sometimes collected and analyzed for these compounds of interest. In these cases, it is important to distinguish between 'innocent' background residues of ILRs from possible transfer during the crime. This study surveys the frequency of occurrence of ILRs in 27 different men's personal care products. After headspace analysis, GC/MS analyses enabled the different components of ILRs to be elucidated through the use of extracted ion chromatograms. All 27 samples tested negative for ILRs. Based on the tested samples, it is very unlikely that in an arson investigation, a male personal care product would lead to false positives in the suspect's clothing.

## Physical Sciences Category

### Physical Sci Poster 13:

#### **Simulating the thermodynamic properties of pH-low insertion peptide using molecular dynamics**

Aleena Andrews, Austin Clark, and Blake Mertz

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

Although there have been promising advances in cancer treatment over the past 20 years, side effects from chemotherapeutics and low survival rates still persist. Targeted drug delivery is the practical solution to decreasing side effects and increasing survival rates, but this is an extremely difficult task. One plausible means could be the use of pH-low insertion peptide (pHLIP). pHLIP is a 36-residue peptide derived from helix C of bacteriorhodopsin. It exists in three states: (I) a coiled monomer in solution, (II) attached to the cell membrane in the coiled form, and (III) inserted into the membrane as a helix. Experimentally, State III only occurs in acidic conditions, allowing us to target tumor cells that have a lower pH than healthy cells. In order to understand its thermodynamic properties, we have used molecular dynamics simulations to determine the thermodynamics of folding and binding of pHLIP. These simulations will give us insights into the biophysical interactions that govern these processes and are the first step towards optimization of pHLIP as a targeted drug delivery vehicle.

### Physical Sci Poster 14:

#### **A computational investigation of DPC micelles**

Caitlin B. Morrow and Blake Mertz

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506*

n-dodecylphosphocoline (DPC) is a surfactant that has a tendency to form micelles in aqueous solution. This is important because micelles can be used in drug delivery, protein solubilization, and enhanced oil recovery. Coarse-grained molecular dynamics simulations were used in this research project to determine the aggregation number of DPC (i.e., the number of molecules required to form a micelle) and how long it takes DPC molecules to form micelles. In order to determine DPC's aggregation number, eight randomly distributed DPC systems were created with 60, 80, 100, 120, 140, 160, 180, and 200 molecules respectively. The systems with eighty molecules of DPC were the only systems that were able to form a single micelle in less than a microsecond. Micelles eventually formed for most systems but over several microseconds. From our results it appears that the true aggregation number of DPC is around eighty molecules. These results provide fundamental understanding of the physical interactions that lead to micelle formation, and will allow us to model protein-micelle complexes, the next step in our planned research.

## Physical Sciences Category

### Physical Sci Poster 15:

#### **Computational study of the energetics of binding and folding of the pH (low) insertion peptide (pHLIP)**

Austin Clark<sup>1</sup>, Zachary Bonham<sup>1</sup>, Aleena Andrews<sup>2</sup>, Chittrak Gupta<sup>1</sup>, and Blake Mertz<sup>1</sup>

<sup>1</sup>*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26505 and*  
<sup>2</sup>*Department of Chemistry, The College of New Jersey, Ewing, NJ 08628*

pH (low) insertion peptide (pHLIP) possess the ability to selectively insert across cell membranes under acidic conditions. Due to this quality, pHLIP could be used to exploit tumor acidosis for targeted chemotherapeutics and drug delivery. pHLIP exists in three states during binding and insertion: an uncoiled monomer in solution at basic pH (State I), bound to a lipid bilayer surface (State II), and in acidic conditions, undergoes transmembrane helical insertion (State III). Through molecular dynamics simulations, pHLIP's binding and insertion into a lipid bilayer can be understood thermodynamically. In this study, we examine the binding and folding process to establish the energetics of each transition and determine the pKa of key residues in pHLIP during the process. By measuring changes in the free energy surface along the extension of pHLIP, preliminary results suggest that the bilayer may contribute 7-10 kcal/mol to the folding of pHLIP after partitioning into the membrane surface.

### Physical Sci Poster 16:

#### **Measurement of argon neutral velocity distribution functions near an absorbing boundary in a plasma**

Zachary D. Short<sup>1</sup>, Derek S. Thompson<sup>1</sup>, Timothy N. Good<sup>2</sup>, and Earl E. Scime<sup>1</sup>

<sup>1</sup>*Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506 and*  
<sup>2</sup>*Department of Physics, Gettysburg College, Gettysburg, PA 17325*

Neutral particle distributions are critical to the study of plasma boundary interactions, where ion-neutral collisions, e.g. via charge exchange, may modify energetic particle populations impacting the boundary surface. Neutral particle behavior at absorbing boundaries thus underlies a number of important plasma physics issues, such as wall loading in fusion devices and anomalous erosion in Hall thruster channels. Neutral velocity distribution functions (NVDFs) are measured using laser-induced fluorescence (LIF). Our LIF scheme excites the  $1s_4$  non-metastable state of neutral argon with 667.913 nm photons. The subsequent decay emission at 750.590 nm is recorded synchronously with injection laser frequency. Measurements are performed near a grounded boundary immersed in a cylindrical helicon plasma, with the boundary plate oriented at an oblique angle to the magnetic field. NVDFs are recorded in multiple velocity dimensions and in a three-dimensional volume, enabling point-to-point comparisons with ion velocity distribution function measurements obtained in the same regions through argon ion LIF.



## Social Sciences & Non-STEM Category

### ***Social Sci/Non-STEM Category Index:***

**Poster 1:** *Frequency and correlates of disordered eating in male figure skaters.*

**Elizabeth M. Janeiro**, Dana K. Voelker, Trent A. Petric, Justine J. Reel & Dan Gould.

**Poster 2:** *The global market bubble contagion: fundamentally sound or irrational noise?*

**Nathan Burks** & Ann Marie Hibbert.

**Poster 3:** *Integrating West Virginia-based music into the state K-8 social studies curriculum.*

**Alexandra Mullins** & Travis Stimeling.

**Poster 4:** *CESTA: promoting appreciation of chemistry by engaging the community through the interactive sculpture glukupikron.* Jessica Hoover, Jason Lee, Todd Hamrick, **Zachary**

**Bonham, Philip Evans**, Erin Matheson, Charlie Scott, Donovan Steele, and Aaron Williams

**Poster 5:** *Staff-child interaction therapy: child behavior change and therapist skill acquisition.*

**Emma Veshecco**, Lauren Ouetsch, Nancy Wallace, Cree Robinson & Cheryl B. McNeil.

**Poster 6:** *Disgust sensitivity: a predictor of sexism?*

**Rachel G. McDonald** & Natalie J. Shook.

**Poster 7:** *In-group and out-group interactions explained with truth default theory.*

**Conrad S. Trump** & Keith Weber.

## **Social Sciences & Non-STEM Category**

### **Social Sci/Non-STEM Poster 1:**

#### **Frequency and correlates of disordered eating in male figure skaters**

Elizabeth M. Janeiro<sup>1</sup>, Dana K. Voelker<sup>1</sup>, Trent A. Petrie<sup>2</sup> Justine J. Reel<sup>3</sup>, and Dan Gould<sup>4</sup>

<sup>1</sup>*College of Physical Activity and Sport Sciences, West Virginia University, Morgantown, WV 26506,*  
<sup>2</sup>*University of North Texas,* <sup>3</sup>*University of North Carolina-Wilmington,* <sup>4</sup>*Michigan State University.*

Although nearly 20 percent of male collegiate athletes are symptomatic of an eating disorder, few studies have examined disordered eating among those in specific sports that may pose the greatest risk. Aesthetic sport athletes are identified as most at risk for disordered eating because of the emphasis on appearance and leanness. This study examined the frequency and correlates of disordered eating among male figure skaters. Participants ( $n=29$ ; mean age=18.45) completed survey measures for disordered eating and several psychological variables, and open-ended items on skating's perceived influence on body image, eating, and exercise. One skater was categorized as symptomatic of an eating disorder. After controlling for body mass index and age, disordered eating was significantly predicted by sport-related weight pressures. Skaters reported that weight pressures come predominantly from performance and appearance demands and significant others in the skating environment. Skaters described both positive and negative influences of skating on body image, eating and exercise. Results suggest that sport-related weight pressures are an important target in preventing body image concerns and unhealthy eating and exercise behaviors in male figure skaters.

### **Social Sci/Non-STEM Poster 2:**

#### **The global market bubble contagion: fundamentally sound or irrational noise?**

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Asset bubbles and financial contagion have long been studied as prevalent phenomena in stock markets around the world. There are various questions that arise as a result of these financial enigmas in that periods of increased market volatility are often generated inherently as a byproduct of these market events. In this study we examine three major financial bubbles and the subsequent contagion in stock indices in two major world economies. The S&P 500 Index is utilized as a proxy for the United States, while the SSE and SZSE Composite Indexes are used as proxies for China. We implement a Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) model to examine the persisting volatility in the U.S. and Chinese indexes during the bubbles. We also study differences in the dynamic correlations to diagnose any trends that developed over time. Our preliminary analysis suggests that the Chinese indices are consistently more prone to volatility shocks, and as a result, dynamic correlations with the U.S. index are decoupled during bubble-induced market crashes.

## Social Sciences & Non-STEM Category

### Social Sci/Non-STEM Poster 3:

#### **Integrating West Virginia-based music into the state K-8 social studies curriculum**

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Implementing music into educational curriculum is a creative, non-traditional facet for learning for students in grades K-8. Using music to support educational standards could advance children's knowledge regarding history, geography, civics, and many other academic disciplines. Students, including those with more creative skill-sets, could also have the opportunity to receive a more holistic education when incorporating the creative arts into their education. In this project, incorporating West Virginia-based music into K-8 state social studies curriculum standards aims to aid students in becoming more knowledgeable of the State's history, traditions and culture, as well as a broad overview of Appalachian regional culture. By integrating West Virginia-based music into their lesson plans, teachers could create a discourse between themselves and their students about the state's past and contemporary social, political and economic environments. Studies within K-8 classrooms have shown that incorporating music into the curriculum aided students in making critical connections between class material and worldly events. The purpose of this project is enhance critical thinking skills by using music to highlight key events and issues within West Virginia and to provide new contexts for understanding this material. The goal of this project is to produce a compact disc of West Virginia music and lesson plans for distribution to West Virginia History K-8 classrooms.

## Social Sciences & Non-STEM Category

### Social Sci/Non-STEM Poster 4:

#### **CESTA: promoting appreciation of chemistry by engaging the community through the interactive sculpture glukupikron**

Jessica Hoover<sup>1</sup>, Jason Lee<sup>2</sup>, Todd Hamrick<sup>3</sup>, Zachary Bonham, Philip Evans, Erin Matheson, Charlie Scott, Donovan Steele, and Aaron Williams

<sup>1</sup>C. Eugene Bennett Department of Chemistry, Eberly College of Arts and Sciences, <sup>2</sup>School of Art and Design, College of Creative Arts, <sup>3</sup>Benjamin M. Statler College of Engineering and Mineral Resources West Virginia University, Morgantown, WV 26506

The Community Engagement in Science Through Art (CESTA) program was created to bring a greater appreciation of chemistry to the Morgantown community and to help the public see chemistry in the perspective of everyday life. During the program, a collaboration of chemistry, engineering, and art students conceptualized an imaginary “bittersweet” molecule “Glukupikron” which combines the sweet compound glucose and the bitter compound phenylthiocarbamide. The students led all aspects of the design and construction of the sculpture, culminating in the creation of a steel form bearing the likeness of the two molecules. This sculpture symbolizes the often bittersweet nature of life through prose, poetry, and personal experiences that were submitted from members of the Morgantown community. The submissions will appear on the sculpture virtually through the use of augmented reality software available on smartphones and other hand-held devices to highlight the idea of bitter sweetness as it relates to chemistry and the human experience. The sculpture will find its permanent home on the Evansdale library grounds this upcoming year. We anticipate this sculpture will help to connect chemistry and daily life in a new and approachable context.

### Social Sci/Non-STEM Poster 5:

#### **Staff-child interaction therapy: child behavior change and therapist skill acquisition**

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Disruptive child behavior problems are a significant concern in Pennsylvania and families seek treatment via home-based services, known as wraparound. Unfortunately, wraparound services have not been shown to be effective to reduce child behaviors compared to evidence-based outpatient therapies, like Parent-Child Interaction Therapy (PCIT). The present study aimed to adapt PCIT into an at-home therapy within wraparound, called Staff-Child Interaction Therapy (SCIT), to improve children’s problem behaviors and the therapists’ skills. Therapists were assigned to SCIT workshops, which taught skills based off PCIT for therapists to implement with their clients, or Compassion Fatigue (CF) workshops, which were a control group. Preliminary findings indicate SCIT therapists reported greater improvements in their clients’ externalizing behaviors,  $p=0.01$ , and overall problem behaviors,  $p=0.049$ . It is shown that therapists in the SCIT group had significantly more positive verbalizations than therapists in the CF group,  $p<0.05$ , and significantly fewer negative verbalizations,  $p<0.05$ . Current findings show SCIT is an effective alternative to wraparound to improve therapists’ use of effective skills and for families seeking to reduce their children’s problem behaviors.

## **Social Sciences & Non-STEM Category**

### **Social Sci/Non-STEM Poster 6:**

#### **Disgust sensitivity: a predictor of sexism?**

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Disgust evolved to protect individuals against pathogens. As other people are a primary source of disease, disgust adapted to regulate social attitudes. Those more sensitive to disgust are more prejudiced toward homosexuals, obese people, etc. The relationship between disgust sensitivity and prejudice is mediated by social conservatism. The current project aimed to see to what extent disgust sensitivity is related to sexism. Participants (Study 1:  $N = 310$ ,  $M_{age} = 19.58$ ; Study 2:  $N = 263$ ,  $M_{age} = 23.27$ ) were recruited for online surveys consisting of measures for disgust sensitivity, sexism, and social conservatism. Across both studies, participants who were more sensitive to disgust endorsed more sexist attitudes. In Study 2, disgust sensitivity was also associated with more socially conservative values, and social conservatism mediated the association between sexism and disgust sensitivity. This suggests that the relation between disgust sensitivity and sexism is driven by social conservatism.

### **Social Sci/Non-STEM Poster 7:**

#### **In-group and out-group interactions explained within truth default theory**

Conrad S. Trump and Keith Weber

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The Truth Default state is a frame of mind that exists within humans that gives humans the innate belief that information we are told is true. Truth Default Theory (TDT) explains the scenario that people leave the truth default state when a trigger event occurs (i.e. deception, lying, omission). However, TDT fails to explain situations that individuals will not need a trigger event to leave the truth default state. In Truth Default Theory's current state, the author Tim Levine expects Truth Default Theory to be mainly applicable to in-group rather than out-group scenarios. Using previous empirical research based on in-group and out-group activity, we can assume that an individual will be more or less likely to leave the truth default state based on how interpersonal the relationship is between the two individuals before deception occurs. We expect our results do be consistent with previous literature published on this subject.