2015 Symposium Brochure

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Summer Undergraduate Research Symposium

Thursday, July 23, 2015
Erickson Alumni Center
West Virginia University
Morgantown, WV

http://universitycollege.wvu.edu/undergraduate-research
nanosafe.wvu.edu - nsf-reu; www.honors.wvu.edu/; www.hsc.wvu.edu/wvucn

Building the Future of West Virginia,
One Idea at a Time
Summer Undergraduate Research Symposium 2015
West Virginia University

Thursday July 23, 2015
Erickson Alumni Center, Ruby Grand Hall

I. Approximate Schedule of Events

9:00-9:30 AM  Poster Setup — Participants arrive, register, and put up posters. Participants must leave Erickson Alumni Center by 9:30 AM and should return at 11:30 AM.

9:30-11:30 AM  Poster judging — No participants present and not open to public.

11:30 AM-12:00 PM  Welcome and Key Note Speaker — All welcome: parents, research advisors, graduate students, undergraduate participants, and general public.

- Welcome: Dr. Michelle Richards-Babb, Associate Professor & Director of the Office of Undergraduate Research, WVU
- Introductory Remarks: Dr. Ken Blemings, Professor & Dean of the Honors College, WVU
- Key Note Speaker: Dr. E. Gordon Gee, President of West Virginia University

12:00-12:15 PM  Break/Lunch — Judges and poster presenters first priority, please.

12:15-2:30 PM  Poster Presentations — Open to all and concurrent with final judging of posters. Poster judging will continue with judges assessing participants’ abilities to answer questions related to their research.

Judges have preference!

2:30-3:00 PM  Awards Ceremony and Closing Remarks

3:00 PM  Poster Take-Down — Any posters remaining after 3:30 PM will be removed by the staff.

3:05 PM  Post-questionnaires (Nano REU & SURE participants)

II. Poster Judges

<table>
<thead>
<tr>
<th>Judge</th>
<th>Affiliation</th>
<th>Category Judging</th>
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<tbody>
<tr>
<td>John Navaratnam</td>
<td>Biology, Eberly College, WVU</td>
<td>Biological &amp; Health Sciences</td>
</tr>
<tr>
<td>Joan Olson</td>
<td>Microbiology &amp; Immunology, School of Medicine, WVU</td>
<td>Biological &amp; Health Sciences</td>
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<tr>
<td>Jessica Turner</td>
<td>Biology, Eberly College, WVU</td>
<td>Biological &amp; Health Sciences</td>
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<tr>
<td>Gloria Oporto</td>
<td>Forestry &amp; Natural Resources, Davis College, WVU</td>
<td>Agricultural &amp; Environmental Sci.</td>
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<tr>
<td>Kevin Howard</td>
<td>Dow Chemical Co. &amp; K4M Consulting</td>
<td>Physical Sciences &amp; Engineering</td>
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<tr>
<td>Natalia Schmid</td>
<td>CS &amp; EE, Statler College, WVU</td>
<td>Physical Sciences &amp; Engineering</td>
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<tr>
<td>David Miller</td>
<td>Mathematics, Eberly College, WVU</td>
<td>Physical Sciences &amp; Engineering</td>
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<tr>
<td>Todd Stueckle</td>
<td>Center for Disease Control/NIOSH</td>
<td>Nanoscience</td>
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<tr>
<td>Carsten Milsmann</td>
<td>Chemistry, Eberly College, WVU</td>
<td>Nanoscience</td>
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<tr>
<td>Paul Hernandez</td>
<td>Educational Psychology, Education, WVU</td>
<td>Social Sciences (&amp; non-STEM)</td>
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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. NanoSAFE Research Experiences for Undergraduates (REU) Site: Multifunctional Nanomaterials (PI: Michelle Richards-Babb; co-PI: David Lederman; Assistant to Director: Stephen Raso)

<table>
<thead>
<tr>
<th>Participant</th>
<th>Poster</th>
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<th>Faculty Advisor</th>
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<tr>
<td>Joseph Ashley</td>
<td>Nanosci #20</td>
<td>Physics &amp; Math</td>
<td>Radford U.</td>
<td>Alan Bristow, Physics</td>
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<tr>
<td>Michael Bates</td>
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<td>Chemistry &amp; Math</td>
<td>West Liberty C.</td>
<td>Blake Mertz, Chemistry</td>
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<td>Leandra Forte</td>
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<td>Brian Popp, Chemistry</td>
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<td>Anna Gutridge</td>
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<td>Biochem. &amp; Molecular Bio.</td>
<td>Wittenberg C.</td>
<td>Yuxin Liu, CSEE</td>
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<td>Austin Jantzi</td>
<td>Nanosci #4</td>
<td>Physics</td>
<td>Grove City College</td>
<td>Mikel Holcomb, Physics</td>
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<td>Robert Eric Johnson</td>
<td>Phys Sci &amp; Eng #10</td>
<td>Chemistry</td>
<td>Asheville-Buncombe Technical CC</td>
<td>Xueyan Song, MAE</td>
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<tr>
<td>Aaron Kessler</td>
<td>Nanosci #12</td>
<td>Biochemistry</td>
<td>WV Wesleyan</td>
<td>Björn Söderberg, Chemistry</td>
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<td>Kelsie Krantz</td>
<td>Bio &amp; Health Sci #9</td>
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<td>Rebekah Krupa</td>
<td>Nanosci #15</td>
<td>Chemistry</td>
<td>St. Francis U.</td>
<td>Tim Nurkiewicz, Physiology &amp; Pharmacol.</td>
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<td>Sara Melow</td>
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<td>Chemistry</td>
<td>Elmira College</td>
<td>Lisa Holland, Chemistry</td>
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#### B. STEM Summer Undergraduate Research Experiences (SURE) Site (Coordinator/Director: Michelle Richards-Babb; Assistant to Director: Stephen Raso)

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<tr>
<td>Catherine Blackwood</td>
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<td>Jennifer Gallagher, Biology</td>
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<td>Shelby Boggs</td>
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<td>Natalie Shook, Psychology</td>
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<td>Evan Brettrager</td>
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<td>David Smith, Biochemistry</td>
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<td>Brittany Brown</td>
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<td>Criminology</td>
<td>WVU</td>
<td>Jim Nolan, Sociology</td>
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<td>Anna Cokeley</td>
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<td>Chemical Eng.</td>
<td>WVU</td>
<td>Kostas Sierros, MAE</td>
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<tr>
<td>Manaswi Daksha</td>
<td>Phys Sci &amp; Eng #13</td>
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<td>Felix Schulze, Physics &amp; Astronomy</td>
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<td>Everett Daly</td>
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<td>Emily Fabyanic</td>
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<td>Brenden McNeil, Geography</td>
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<td>Oliver Lin</td>
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aSupported by an NSF EPSCoR Research Infrastructure Improvement Cooperative Agreement #1003907 administered by NanoSAFE at WVU (http://nanosafe.wvu.edu); Technical PI: David Lederman.
bSupported by grant funding from the Air Force (PI: John Christian)
cSupported by grant funding from NASA (SmallSat Precision Navigation with Low-Cost MEMS IMU Swarms; PI: John Christian)
dSupported by grant funding from NASA.
### Participant Poster Major Home School Faculty Advisor

<table>
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<tr>
<td>Stephanie Arnold</td>
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<td>WVU</td>
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<td>Nicole Hegele</td>
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<td>Ming Pei, Orthopedics</td>
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<td>Benjamin Wilson</td>
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<td>Elec. Eng. &amp; Biometric Syst.</td>
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<td>Thirimachos Bourlai, CS &amp; EE</td>
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*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).*

**D. Center for Neuroscience Summer Undergraduate Research Internships (SURI) (Director: George A. Spirou; Coordinator: Erica Stewart)**

<table>
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<td>Melanie Matyi</td>
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<td>U. of Pittsburgh</td>
<td>Paola Pergami, Pediatrics</td>
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<tr>
<td>Cole Michael</td>
<td>Bio &amp; Health Sci #29</td>
<td>Biochemistry</td>
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<td>Andrew Dacks, Biology</td>
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<tr>
<td>Daniella Munezero</td>
<td>Bio &amp; Health Sci #4</td>
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<td>California Baptist University</td>
<td>Visvanathan Ramamurthy, Ophthalmology</td>
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<tr>
<td>Allison Murphy</td>
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<td>Peter Mathers, Otolaryngology</td>
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<tr>
<td>Patrick O’Neill</td>
<td>Social Sci #6</td>
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<td>Cornell University</td>
<td>Julie Brefczynski-Lewis, Physiology &amp; Pharmacology</td>
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<tr>
<td>Magenta Silberman</td>
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<td>James W Lewis, Physiology &amp; Pharmacology</td>
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<tr>
<td>Laura Siqueiros</td>
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<tr>
<td>K’Ehleyr Thai</td>
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<td>James Simpkins, Physiology &amp; Pharmacology</td>
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<tr>
<td>Ellen Woon</td>
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<td>Steven Kinsey, Psychology</td>
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<tr>
<td>Wenyi Zhang</td>
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<td>Columbia University</td>
<td>Miranda Reed, Psychology</td>
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### E. Brazil Scientific Mobility Program

<table>
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<tr>
<th>Participant</th>
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<th>Faculty Advisor</th>
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<tbody>
<tr>
<td>Debora Yamamoto Bonacina</td>
<td>Ag &amp; Env Sci #14</td>
<td>Environmental Engineering</td>
<td>State University of Mato Grosso do Sul, Brazil</td>
<td>Eugenia Pena-Yewtukhiw, Plant &amp; Soil Sciences</td>
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<tr>
<td>Daniela Maria Fernandes Tavares</td>
<td>Ag &amp; Env Sci #14</td>
<td>Environmental Engineering</td>
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<td>Eugenia Pena-Yewtukhiw, Plant &amp; Soil Sciences</td>
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<tr>
<td>Rogério Flores</td>
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<td>Bianca Fernandes Darissi</td>
<td>Ag &amp; Env Sci #17</td>
<td>Forest Engineering</td>
<td>Federal University of Espirito Santo</td>
<td>Eugenia Pena-Yewtukhiw, Plant &amp; Soil Sciences</td>
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### F. Graph Theory and Combinatorics Math Research Experiences for Undergraduates (REU) Site (PI: Rong Luo; co-PI: Kevin Milans)

<table>
<thead>
<tr>
<th>Participant</th>
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<tr>
<td>Jordan Almeter</td>
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<td>Kevin Milans, Mathematics</td>
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<td>Jonathan Ashbrock</td>
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<td>Samet Demircan</td>
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<tr>
<td>Ethan Gegner</td>
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<td>Rachel Gouveia</td>
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<tr>
<td>Andrew Kallmeyer</td>
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<td>Mathematics</td>
<td>Miami University</td>
<td>Kevin Milans, Mathematics</td>
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<tr>
<td>Sarah Locke</td>
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<td>University of Tennessee, Martin</td>
<td>Hong-Jian Lai, Mathematics</td>
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<tr>
<td>Kate Lorenzen</td>
<td>Phys Sci &amp; Eng #21</td>
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<td>Juniata College</td>
<td>Rong Luo, Hong-Jian Lai &amp; Cun-Quan Zhang, Mathematics</td>
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<td>William Noland</td>
<td>Phys Sci &amp; Eng #24</td>
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<td>Joshua Thompson</td>
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<td>Rong Luo, Hong-Jian Lai &amp; Cun-Quan Zhang, Mathematics</td>
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<td>Andrea Trice</td>
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<td>Hong-Jian Lai, Mathematics</td>
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<td>Robert Winslow</td>
<td>Phys Sci &amp; Eng #23</td>
<td>Mathematics</td>
<td>The University of Kansas</td>
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### G. Faculty Supported or Self-Supported

<table>
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<tbody>
<tr>
<td>Conner Castle</td>
<td>Nanosci #3</td>
<td>Aerospace Eng.</td>
<td>WVU</td>
<td>Nick Wu, MAE</td>
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<tr>
<td>Austin Clark</td>
<td>Nanosci #8</td>
<td>Chemistry</td>
<td>WVU</td>
<td>Blake Mertz, Chemistry</td>
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<tr>
<td>Michael Spencer</td>
<td>Phys Sci &amp; Eng #30</td>
<td>Chemistry &amp; Physics</td>
<td>WVU</td>
<td>Fabien Goulay, Chemistry</td>
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IV. Speakers at REU/SURE Events

<table>
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<tr>
<th>Speaker</th>
<th>Affiliation</th>
<th>Group(s)</th>
<th>Topic</th>
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</thead>
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<tr>
<td>David Lederman</td>
<td>Dept. of Physics, WVU</td>
<td>Nano REU</td>
<td>Basis Aspects Nanosci./Eng.</td>
</tr>
<tr>
<td>Barbara Foster</td>
<td>Dept. of Chemistry, WVU</td>
<td>Nano REU &amp; SURE</td>
<td>Laboratory Safety</td>
</tr>
<tr>
<td>Melinda Hollander</td>
<td>Animal Compliance &amp; Training Officer, Office of Research Integrity &amp; Compl.</td>
<td>REU &amp; SURE</td>
<td>Ethics of Animal Use &amp; Care</td>
</tr>
<tr>
<td>Dr. Weiqiang Ding &amp; Dr. Kolin Brown</td>
<td>WVU Shared Research Facilities, WVU</td>
<td>Nano REU</td>
<td>Nanoscale Characterization &amp; Nanofabrication Methods</td>
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<tr>
<td>Graduate Students from Various WVU Disc.</td>
<td>IGERT Fellows &amp; Graduate Dislines</td>
<td>Nano REU &amp; SURE</td>
<td>Peer Advice</td>
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<tr>
<td>Kim Quedado</td>
<td>NanoSAFE, WVU</td>
<td>Nano REU &amp; SURE</td>
<td>IGERT Fellow Participation, Science Communication &amp; Morgantown Kid’s Day</td>
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<tr>
<td>Jennifer Robertson-Honecker</td>
<td>Extension, WVU</td>
<td>SURE</td>
<td>Science Outreach</td>
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<tr>
<td>Michelle Richards-Babb</td>
<td>Dept. of Chemistry, WVU</td>
<td>Nano REU</td>
<td>Oral Present. Skills/Lab Notebks, Ethics, Poster Preparation</td>
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<tr>
<td>Jessica Turner</td>
<td>Biology, WVU</td>
<td>REU, SURE &amp; SURI</td>
<td>Oral Presentation Skills</td>
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<tr>
<td>Linda Blake</td>
<td>Wise Library, WVU</td>
<td>Nano REU &amp; SURE</td>
<td>Scientific Search Tools</td>
</tr>
<tr>
<td>Amy Cyphert &amp; Cate Johnson</td>
<td>ASPIRE Office, WVU</td>
<td>SURE</td>
<td>Prestigious Scholarships</td>
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<tr>
<td>Toni Jones &amp; Jesse Sigley</td>
<td>Career Services, WVU</td>
<td>SURE</td>
<td>Cover letters, resumes, &amp; Interviewing/Elevator speech</td>
</tr>
<tr>
<td>Shelly Stump</td>
<td>WVU Office of Graduate Admissions &amp; Recruiting</td>
<td>REU &amp; SURE</td>
<td>Graduate School Roundtable</td>
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<tr>
<td>Jason Gross</td>
<td>Assistant Professor Statler College, WVU</td>
<td>REU &amp; SURE</td>
<td>Career Mentoring: Academia</td>
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<tr>
<td>Beth Cleveland</td>
<td>USDA</td>
<td>REU &amp; SURE</td>
<td>Career Mentoring: Government</td>
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<tr>
<td>Kathleen Reschke</td>
<td>Mylan Pharmaceuticals</td>
<td>REU &amp; SURE</td>
<td>Career Mentoring: Industry</td>
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</tbody>
</table>

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?
NanoSAFE: http://nanosafe.wvu.edu/
Nano REU: http://nanosafe.wvu.edu/education/undergraduate-programs/reu
STEM SURE & WVU Honors administered SURE: http://honors.wvu.edu/current-students/programming/summer-programs/summer-undergraduate-research-experience
WVU Center for Neuroscience SURI: http://www.hsc.wvu.edu/wvucn/Summer-Internships-(SURI)
Math REU: http://math.wvu.edu/REU/

VI. Acknowledgements

A. Personnel

Nano REU
Michelle Richards-Babb, PI
David Lederman, co-PI
Stephen Raso, Asst. to REU Director

STEM SURE
Stephen Raso, Asst. to SURE Director & TA
With help from the Eberly College of Arts and Sciences Business Office

WVU Honors administered SURE
Ken Blemings, PI & Director
Christian Carey

SURI
George A Spirou, Director
Erica Stewart, Coordinator

Symposium Booklet
Michelle Richards-Babb
Stephen Raso
Becky Secrist

Symposium Planning
Ken Blemings
Christian Carey
Michelle Richards-Babb
Stephen Raso
B. Financial Support

1. **Nano REU (PI: Michelle Richards-Babb, co-PI: David Lederman)**
   National Science Foundation (NSF) Divisions of Materials Research and Chemistry (DMR-1262075) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.

2. **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, and the Davis College of Agriculture, Natural Resources, and Design.

3. **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.

4. **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.

5. **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).

6. **NanoSAFE (Technical PI: David Lederman, Education & Outreach Coordinator: Kim Quedado)**
   Stipends and tuition for 17 SURE participants were funded by an NSF EPSCoR Research Infrastructure Improvement Cooperative Agreement #1003907 administered by NanoSAFE at WVU (http://nanosafe.wvu.edu).

7. **The Brazil Scientific Mobility Program**
   The initiative is administered by IIE (Brazilian government) is centered on providing scholarships to the best students from Brazil for study abroad at the world’s top universities. The program provides an exchange experience at a U.S. college or university to a diverse group of emerging Brazilian student leaders, widening the academic and research exchange between the U.S. and Brazil. This initiative is the result of joint efforts from two sponsoring organizations, CAPES and CNPq.

8. **Math REU (PI: Rong Luo, co-PI: Kevin Milans)**
   Supported by National Security Agency in 2015.

9. **Research Symposium Monetary Prizes**
   Sponsored by NanoSAFE via an NSF EPSCoR RII Cooperative Agreement.
**Biological and Health Sciences Category**

**Bio & Health Sci Index:**

**Poster 1:** Riluzole rescues glutamate transient alterations in a mouse model of Alzheimer’s disease. **James Hickman**, Holly Hunsberger & Miranda Reed.

**Poster 2:** Modeling a decoding network of spatially and temporally patterned olfactory responses. **Jordan Drew**, Samuel Bradley, Kevin Daly & Gary Marsat.

**Poster 3:** Differences in brain connectivity reflect cognitive abilities in pre-adolescent children. **Melanie Matyi**, Hannah Greenbaum, Christopher Frum & Paola Pergami.

**Poster 4:** A unique protein phosphate expressed in photoreceptor neurons. **Daniella Munezero**, Tanya Dilan, Peter Stoilov & Visvanathan Ramamurthy.

**Poster 5:** A bioinformatics approach to identifying negative regulators in the Interleukin 12 pathway. **Cassidy Bland** & David Klinke.

**Poster 6:** Supercritical carbon dioxide assisted decellularization for regenerative medicine. **Anna Gilpin**, Kai Wang & Yong Yang.

**Poster 7:** The effects of endogenous serotonin levels of olfactory behavior in Drosophila melanogaster. **Sarah Michaels** & Andrew Dacks.

**Poster 8:** Investigation of mitochondrial morphology and mechanics in response to mutant huntingtin. **Pranav Jain**, Nicole Shamitko-Klingensmith & Justin Legleiter.

**Poster 9:** Total synthesis of dilemmaone x, an interesting indole derivative found in sea sponges. **Kelsie Krantz**, Katy Lambson & Björn Söderberg.

**Poster 10:** The evolution of a flight sensory-motor to primary olfactory center circuit in insects. **Mouaz Haffar**, Samuel Bradley, Andrew Dacks & Kevin Daly.

**Poster 11:** Preconditioning strategies impact regeneration of nucleus pulposus from human herniated discs. **Shanawar Waris**, Tyler Pizzute, Ying Zhang & Ming Pei.

**Poster 12:** Morphological and viscoelastic changes in lipid membranes with respect to cholesterol concentration. **Peter Grimson** & Justin Legleiter.

**Poster 13:** Semi-automated Technique for extraction and segmentation of neuronal bodies and nuclei. **Peter Chen**, Maher Shammaa, Michael Morehead & George Spirou.

**Poster 14:** Dopaminergic genetic variation moderates the effect of nicotine on cigarette reward. **Erin Hudnall**, Paul Harrell, Hui-Yi Lin, Jong Park, Melissa Blank, David Drobes & David Evans.

**Poster 15:** Does limb dominance affect the control and accuracy of reaching movements? **Laura Siqueiros**, Erienne Olesh & Valeriya Gritsenko.
Biological and Health Sciences Category

**Poster 16:** Comparison of acute and chronic effects of cannabinoids Δ⁹-tetrahydrocannabinol and JWH-018. Ellen Woon, Sara Nass & Steven Kinsey.

**Poster 17:** Age-related changes of glutamate transients in a mouse model of Alzheimer’s disease. Wenyi Zhang, Holly Hunsberger & Miranda Reed.

**Poster 18:** Involvement of JAK2, STAT1 and STAT3 in endoplasmic reticulum stress-induced inflammation. John Nowery, Lauren Corella & Gordon Meares.

**Poster 19:** Different dilutions of odor elicit specific neurophysiological responses in Manduca sexta. Ahmed Mian, Phillip Chapman & Kevin Daly.

**Poster 20:** Seeding huntingtin aggregation with distinct huntingtin fragments. Ashley Leslie & Justin Legleiter.

**Poster 21:** Evidence of multiple echo neuron systems and their relation to language lateralization. Magenta Silberman, Chris Frum & James Lewis.

**Poster 22:** Rx gene knockdown and optic vesicle formation in organoid cultures. Allison Murphy, Helen Rodgers & Peter Mathers.

**Poster 23:** Effects of JNK activity on postnatal laminar positioning of cortical interneurons. Kathryn Baker, Abigail Myers & Eric Tucker.

**Poster 24:** TNF-alpha induced secretion of exosomes containing miRNA-34a decreases mitochondrial function. K’Ehleyr Thai, Danielle Doll & James Simpkins.

**Poster 25:** Analysis of a regulatory mutation in Drosophila protein kinase CK2. Yasamin Samadi & Ashok Bidwai.

**Poster 26:** Ascending mechanosensory pathways in the brain of Drosophila melanogaster. Cory Pittman, Joseph Van Dyke, Sarah Farris & Andrew Dacks.

**Poster 27:** The effects of the CK2 inhibitor CX4945 in an orthotopic mouse tongue tumor model. River Hames, Steve Markwell, Erik Interval & Scott Weed.

**Poster 28:** In vitro activity of common operating room materials against Staphylococcus aureus biofilm. Emily Ernest, Matthew Dietz, Jonathon Karnes & Siddharth Sharma.

**Poster 29:** The innervation status of antennal lobe glomeruli by the csd neuron in Drosophila melanogaster. Cole Michael, Kaylynn Coates & Andrew Dacks.

**Poster 30:** Dynamic conformations of PAN coiled-coils and their effect on proteasome activity. Evan Brettrager, Aaron Snoberger & David Smith.

**Poster 31:** Determining the role of Jnk3 in the migration of cortical interneurons during development. Kelly Stake, Abigail Myers & Eric Tucker.
**Bio & Health Sci. Poster 1:**

**Riluzole rescues glutamate transient alterations in a mouse model of Alzheimer’s disease**

James E. Hickman, Holly C. Hunsberger, & Miranda N. Reed

*Behavioral Neuroscience Program, Department of Psychology, West Virginia University, Morgantown, WV 26505*

Individuals at risk for Alzheimer’s disease (AD) often exhibit hyperexcitability in the hippocampus, a brain region important for learning and memory. Our previous work suggests a dysregulation of glutamate neurotransmission may mediate this hyperexcitability. Although beneficial at low levels, at high levels glutamate can result in cell death, a process known as excitotoxicity. Furthermore, glutamate dysregulation correlates with memory deficits in the TauP301L mouse model of AD. We previously showed that riluzole, an FDA-approved drug for ALS, could improve glutamate uptake and memory deficits in our TauP301L mouse model. The goal of the current study was to determine if P301L tau expression would alter spontaneous glutamate release (transients) and whether riluzole would attenuate P301L-mediated alterations in transient signaling. We used a novel technique, microelectrode arrays (MEAs), to measure glutamate transients in anesthetized transgene negative controls, vehicle-treated P301L, and riluzole-treated P301L mice. We found that riluzole improved glutamate uptake and reduced the number of transients per minute and amplitude.

**Bio & Health Sci. Poster 2:**

**Modeling a decoding network of spatially and temporally patterned olfactory responses.**

Jordan Drew, Samuel Bradley, Kevin Daly, and Gary Marsat

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

Our internal representation of the world begins with the input of various stimuli. To process stimuli, nervous systems have evolved specialized cells, or sensory neurons, that respond to specific features of the world. The spatiotemporal pattern of neuron activity correlates with the identity of the stimulus. The format in which patterns of neural activity represent stimuli is called a neural code. At each level of the nervous system the neurons decode the information it receives, and encodes the result into a new neural code. The olfactory system of Manduca sexta, the antennal lobe (AL), has been used to study odor coding, but how higher order centers decode information is not well understood. We modeled a decoding mechanism of the AL output to understand how decoding mechanisms can be adjusted to a specific coding scheme. We found that specific patterns of connections allow for the extraction of stimulus identity. Most importantly, the information encoded in the temporal component of the AL response enhanced odor identification but could be decoded effectively only if connection weights were dynamic.
Bio & Health Sci. Poster 3:

Differences in brain connectivity reflect cognitive abilities in pre-adolescent children

Melanie Matyi, Hannah Greenbaum, Christopher Frum and Paola Pergami

Center for Neuroscience at the Robert C. Byrd Health Sciences Center, West Virginia University, Morgantown, WV 26506

Currently diffusion tensor imaging (DTI) and resting state functional connectivity MRI (rs-fcMRI) are not used clinically but could be useful in identifying biomarkers of cognitive function. While rs-fcMRI can elucidate the underlying functional brain network by the strength of the connections between cortical regions, DTI can quantify the strength of structural connections. Healthy pre-adolescent children aged 7-11 (n=6) completed cognitive functioning tests of working memory, processing speed and language, DTI and rs-fcMRI. The children were divided into two groups according to their cognitive testing scores, fractional anisotropy (FA) was calculated for nine regions from DTI data and correlations between 14 cortical regions were calculated from rs-fcMRI data. Functional correlations between cortical regions of children in the higher cognitive functioning group were stronger than those of the lower group with the strongest correlations occurring bilaterally in the thalamus and hippocampus. No differences in FA were identified in corresponding white matter regions between the two groups. These preliminary results suggest that rs-fcMRI is a stronger biomarker of cognitive deficits than DTI.

Bio & Health Sci. Poster 4:

A unique protein phosphatase expressed in photoreceptor neurons

Daniella Munezero, Tanya Dilan, Peter Stoilov and Visvanathan Ramamurthy

Departments of Biochemistry and Ophthalmology, West Virginia University, Morgantown, WV 26506

The inactivation of rhodopsin, a GPCR, involved in phototransduction after light stimulation is crucial for the health of photoreceptor neurons, as defects in this process lead to blindness. Phosphorylation of rhodopsin followed by the binding of arrestin shuts-off rhodopsin mediated signaling. Subsequent dephosphorylation of rhodopsin and regeneration with 11-cis retinal restores photoreceptor’s sensitivity to light. Despite several decades of research, the identity of the phosphatase that dephosphorylates rhodopsin is unknown. Our RNA-seq analysis of transcripts that are expressed in rods and cones identified a protein phosphatase family exclusively expressed in the photoreceptors. We hypothesize that this phosphatase dephosphorylates rhodopsin to restore light sensitivity. Our current efforts are focused on generating an antibody against this protein, testing the enzymatic activity and creation of an animal model lacking phosphatase. We have made a His-Tagged full-length and GST-tagged protein for the antibody generation that will be used for localization in retinal neurons and confirmation of our mouse knockout model. The proposed studies will lead to a deeper understanding of the phototransduction cascade and our vision.


**Bio & Health Sci. Poster 5:**

A bioinformatics approach to identifying negative regulators in the Interleukin 12 pathway

Cassidy Bland and Dr. David Klinke

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

Emerging treatments of cancer involve engaging the immune system to kill malignant cells. Immunotherapies rely on protein signals, such as cytokines, to induce or suppress immunologic reactions. These protein signals initiate intracellular signaling cascades that are dynamically regulated through feedback mechanisms that are not well understood. One cytokine that plays an important role in organizing an immune response against tumors is Interleukin 12. Previously, our laboratory has shown Interleukin 12 (IL 12) activates STAT 4 and STAT 1 within the JAK-STAT signal transduction pathway. However, expression of these two proteins is differentially regulated. The objective of this study is to identify proteins that negatively regulate the IL-12 pathway. Using microarray data, we will examine gene expression that changes in response to IL-12 and we will identify clusters of genes that are co-regulated. Computational tools will be used to analyze data from the National Center for Biotechnology database for this study. This will help us identify negative feedback regulation and dynamics of the Interleukin 12 signaling pathway.


**Bio & Health Sci. Poster 6:**

Supercritical carbon dioxide assisted decellularization for regenerative medicine

Anna Gilpin, Kai Wang and Yong Yang

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

In living tissues, the extracellular matrix (ECM) provides biochemical and structural cues to regulate cell phenotype and function. A prominent strategy of regenerative medicine is to decellularize the ECM (rid the ECM of its native cells and DNA while maintaining its biochemical and structural properties) and repopulate it with stem cells to engineer functional tissues and organs. Traditional methods of decellularization employ surfactants such as sodium dodecyl sulfate. While these chemicals effectively decellularize the ECM, they are toxic and damaging to structural proteins. Supercritical carbon dioxide (scCO2), a non-toxic, non-deforming solvent, is commonly used in extraction applications, making it a potential aid for decellularization. We explored decellularization of confluent human dermal fibroblast cells using scCO2 by investigating the effects of the scCO2 pressure, scCO2 saturation time, isopropyl alcohol addition, releasing patterns, and sonication. It was found that overnight storage at 4°C, a longer saturation time, and sonication improved the decellularization efficiency. The time- and cost-effective nature of this procedure has the potential to allow for mass-production of engineered tissues to be used in regenerative medicine.
Bio and Health Sci. Poster 7:

The effects of endogenous serotonin levels on olfactory behavior in *Drosophila melanogaster*

Sarah M. Michaels and Andrew M. Dacks

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

*Drosophila melanogaster*, fruit flies, use their olfactory system to locate and detect sources of food. Depending on the physiological state of *Drosophila*, the olfactory system becomes more or less sensitive to odorants by neuromodulators such as serotonin. We know that when exogenous serotonin is applied to the antennal lobe, the responses of neurons are enhanced, but very little is known about its consequences for behavior. We manipulated the sole source of endogenous serotonin to the olfactory system (the “CSD” neurons) to understand how the CSD neurons play a role in the innate attraction to apple cider vinegar. Depolarization of the CSD neurons was suppressed by the expression of a persistently active K⁺ channel. Therefore, less serotonin was released and was not able to temper the neural circuits controlling olfactory behavior. We propose that the flies’ sensitivity to apple cider vinegar will decrease and thus their attraction to low concentrations of odors will decrease.

Bio and Health Sci. Poster 8:

Investigation of mitochondrial morphology and mechanics in response to mutant huntingtin.

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Misfolding of the mutant form of the huntingtin (htt) protein is characteristic of Huntington’s Disease, a neurodegenerative disorder. It is thought that subcellular organelles such as mitochondria might be targets of toxicity caused by the htt aggregates. The objective of this study is to investigate the interaction between mitochondrial surfaces and mutant htt protein. In order to accomplish this, mitochondria were extracted from a neuronal mouse cell line. To visualize interaction, Atomic Force Microscopy (AFM) is being used. It has been found that mitochondria can be successfully imaged using AFM both in air and in fluid environments. Optimal imaging conditions are being pursued that include changes in imaging buffer and surface properties. Upon obtaining optimal imaging conditions, the mitochondria will be exposed to mutant htt protein. AFM will be used to study morphological and mechanical changes in the mitochondria. Also, the development of protein aggregates will be studied in response to exposure to mitochondrial surfaces. Understanding mutant htt interaction with mitochondria could potentially lead to a therapy to combat toxicity in the future.
Bio & Health Sci. Poster 9:

Total synthesis of dilemmaone x, an interesting indole derivative found in sea sponges

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Indoles are an important structure of many pharmaceuticals, cosmetics, and potentially anti-cancer drugs. Scientists have recently extracted three indole derivatives from *Ectyonanchora flabellate*. During isolation, the three compounds were mixed up thus the name dilemmaone was appropriate. Due to a great interest in these indole derivatives, an inexpensive and environmentally friendly synthesis is necessary for more research on these unusual compounds. A retrosynthesis was executed to determine which steps were necessary in the total synthesis. A multistep synthesis was then proposed starting with toluene and an acyl chloride both of which are very inexpensive starting materials (as shown above). The execution of a gold nanoparticle catalyst for the final synthetic cyclization step has been speculated, and is also under experimentation. Research has produced average yields of 60% for the first four steps of this total synthesis, and the reaction conditions at which the highest yields are obtained have been determined. Upon finishing this total synthesis, biological testing and research on cytotoxicity will be implemented to determine the potential benefits or hazards of these derivatives.

Bio & Health Sci. Poster 10:

The evolution of a flight sensory-motor to primary olfactory center circuit in insects

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Sensory systems have evolved neural circuits to optimize sensory processing within their environmental niches. Olfactory systems have the ability to process rapid, periodic stimuli that are tightly linked to active sampling behaviors. In the moth *Manduca sexta* wing beating causes oscillatory airflow over the antenna, and our preliminary studies have identified a neural circuit connecting the flight sensory motor centers to the primary olfactory center’s antennal lobe (AL) - the mesothroacic to deutocerebral histamine neurons (MDHns). However, whether these neurons are directly linked to the ability to process natural stimuli encountered during flight is unknown. We hypothesize that the presence of this circuit is dependent on the behavioral constraints imposed on the animal, and therefore, we have chosen a comparative approach to map the neuron’s presence in the class of Insecta. Using immunohistochemistry we examined the structure of MDHns in the orders: Blattaria (cockroaches), Hemiptera (true bugs), Coleoptera (beetles), and Lepidoptera (moths and butterflies). Thus far, we have confirmed the MDHns within the three moth species of lepidoptera *Grapholita molesta*, *Galleria mellonella*, and *Manduca sexta*. 
**Bio & Health Sci. Poster 11:**

**Preconditioning strategies impact regeneration of nucleus pulposus from human herniated discs**

Shanawar A.Waris\(^1,2\), Tyler Pizzute\(^1,3\), Ying Zhang\(^1,4\), Ming Pei\(^1,3,4\)

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Intervertebral disc (IVD) degeneration induces neural compression, leading to lower back pain and motor deficiency. Current therapeutic techniques for IVD repair present numerous obstacles. Autologous nucleus pulposus (NP) cell rejuvenation provides a promising approach for the treatment of IVD degeneration. In this study, NP cells isolated from herniated disc patients (n=2) were expanded in the presence of fibroblast growth factor 2 (FGF-2), hypoxia, and stem cell deposited extracellular matrix (ECM). This was followed by redifferentiation induction in a pellet culture system. Cell proliferation will be evaluated using cell counting, proliferation index, and surface marker analysis. Currently, collected data showed that hypoxia pretreatment did not significantly change cell proliferation; interestingly, FGF-2 pretreatment yielded the largest cell number, followed by the ECM group. Redifferentiation capacity will be evaluated using histology, biochemical analysis, and real-time PCR. Compared to expansion in hypoxia, both FGF-2 and ECM preconditioning yielded larger 21-day pellets, indicating enhanced redifferentiation capacity. Further evaluation will be completed in the coming weeks. The preliminary data suggests preconditioning strategies can benefit NP cell rejuvenation and herniated disc patients.

**Bio & Health Sci. Poster 12:**

**Morphological and viscoelastic changes in lipid membranes with respect to cholesterol concentration**

Peter J. Grimson, Justin Legleiter

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Cholesterol is an important component of living organisms, and has a number of effects on the organization and functionality of lipid membranes. Neurodegenerative disorders such Alzheimer's and Huntington's disease interact with the role of cholesterol in the brain, but these mechanisms are still poorly understood. The goal of this experiment is to highlight the effects cholesterol has on the assembly and functionality of lipid bilayer domains. Samples of various ratios of phospholipids, Sphingomyelin, and cholesterol were created and then subsequently annealed in a high humidity environment to foster an energetically favorable structure. Atomic Force Microscopy was utilized in order to quantify the assembly of structures using phase contrast and topographic modes. Post-imaging analysis suggests that increased concentration of cholesterol varies the height of domains (+-0.03 nm) and their ability to assemble. The data collected emphasizes the dramatic effects cholesterol has on the domains of lipid membranes. Further research using these methods into cholesterol-related pathways as they interact with proteins associated with neurodegenerative diseases would potentially yield valuable results.
Bio & Health Sci. Poster 13:

Semi-automated technique for extraction and segmentation of neuronal bodies and nuclei

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In connectomics, segmentation requires extensive time and manual effort. Automation of various pipelines in segmentation can dramatically reduce the level of effort required to analyze connectomic data. In this study, we present a novel semi-automated method for the extraction of neuronal cell bodies and nuclei. This technique leverages machine learning classification algorithms for the automated recognition of nuclei, which are more uniform in shape than cell bodies and easier for the program to recognize. This program outputs all the shapes of nuclei in a data volume. The data is processed with our novel proximity based separation algorithm, which combines shape and size filtering. After separation, volumes containing complete cell bodies are written out to file. These volumes may then be quickly segmented with another semi-automated tool. We assess and report speed increase from manual segmentation and describe false positive rates.

Bio & Health Sci. Poster 14:

Dopaminergic genetic variation moderates the effect of nicotine on cigarette reward

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The reinforcing effects of smoking are influenced by genetic variation in dopaminergic activity of the mesolimbic pathway. The purpose of this secondary data analysis was to examine smokers’ subjective response to cigarettes as a function of their genotype at dopamine receptor (DRD4) polymorphisms: a variable number tandem repeat (VNTR) polymorphism (rs1805186) and three single nucleotide polymorphisms (SNPs: rs936460, rs946461, and rs12280580). Smokers (N=96; ≤15 cigarettes per day) participated in two within-subject, counter-balanced conditions that differed by cigarette dose smoked: nicotine (8.9 mg) or placebo (1.0 mg). Within a condition, participants smoked four of their condition-assigned cigarette following overnight nicotine/tobacco abstinence, and completed the modified Cigarette Evaluation Questionnaire after each smoking bout. DRD4 VNTR homozygous short allele carriers (S:S) reported reduced craving and greater satisfaction and calming between nicotine and placebo cigarette across bouts, whereas long allele carriers (S:L, L:L) did not. For the three SNPs, subjective responses were significantly different between cigarette doses for homozygous major carriers, but not minor allele carriers. Results support the idea of tailoring smoking cessation treatments based on specific genotypes.
Bio & Health Sci. Poster 15:

Does limb dominance affect the control and accuracy of reaching movements?

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The central nervous system is thought to control movement through synergies, which form separate modules used to simplify control. It is unknown if synergies are formed independently in each hemisphere or are defined by the dominant hemisphere. To find the answer to this question, healthy subjects performed a variety of reaching tasks with both arms. Muscle activity and kinematic (motion) data were recorded simultaneously during movements using electromyography (EMG) and motion capture systems. Data were imported and analyzed using custom scripts in Matlab to calculate joint angles, movement velocity, and joint torques. Muscle synergies and movement related synergies were extracted from the EMG and kinematic data using non-negative matrix factorization. To examine the effect of dominance on the control of movement, synergies were compared between the dominant and non-dominant limbs. Additionally, accuracy of the movements was compared between the two limbs to evaluate the effect of different synergies on performance.

Bio & Health Sci. Poster 16:

Comparison of acute and chronic effects of cannabinoids \(\Delta^9\)-tetrahydrocannabinol and JWH-018

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Acute administration of cannabinoids (i.e., cannabis-like drugs) induces analgesia, catalepsy, sedation, and decreased body temperature. However, chronic cannabinoid users develop tolerance and are susceptible to withdrawal. The goal of the present study was to test the hypotheses that (1) cannabinoids induce behavioral effects acutely; while (2) chronic administration and precipitated withdrawal will result in tolerance and altered motivational behavior, respectively. We investigated the cannabimimetic effects of the phytocannabinoid \(\Delta^9\)-tetrahydrocannabinol (THC) and the synthetic cannabinoid JWH-018 on analgesia (tail immersion test), anxiety-like behavior and sedation (marble burying test), body temperature, and catalepsy. We also investigated chronic cannabinoid administration and withdrawal on anxiety-like behavior and sedation in the marble burying test. Acute administration of THC or JWH-018 dose-dependently exerted behavioral and hypothermic effects. Mice chronically administered THC or JWH-018 showed tolerance to the acute effects of sedation. Mice subjected to THC withdrawal buried fewer marbles; whereas mice subjected to JWH-018 withdrawal buried more marbles than vehicle mice. These data indicate that chronic cannabinoid administration results in tolerance; while THC withdrawal significantly alters motivational behavior.
**Bio & Health Sci. Poster 17:**

**Age-related changes of glutamate transients in a mouse model of Alzheimer’s disease**

Wenyi Zhang, Holly C. Hunsberger, & Miranda Reed

*Department of Psychology, West Virginia University*

Hyperexcitability of the memory network, specifically in the hippocampal regions, is an early feature of the aging brain before Alzheimer’s disease (AD) onset. This hyperactivity is likely mediated by glutamate and may directly lead to memory deficits. However, mechanisms of age-dependent susceptibility to hyperactivity are poorly understood. The current study focused on the age-related changes in glutamate signaling, specifically glutamate transients, in control and TauP301L mice, a commonly used mouse model of AD. Glutamate transients are spontaneous bursts of glutamate and have been shown to alter with age. We used novel microelectrode arrays (MEAs) to measure glutamate transients in the hippocampus (DG, CA3 and CA1) of young and aged mice respectively at 10 (5 months of Tau expression) and 22 months of age (5 months of Tau expression). Age- and tau-related changes in the number of glutamate transients per minute and transient duration were found in CA3, suggesting a decrease in transient clearance. These data support dynamic changes in glutamate regulation during aging in sub-regions of the hippocampus critical for learning and memory.

**Bio & Health Sci. Poster 18:**

**Involvement of JAK2, STAT1, and STAT3 in endoplasmic reticulum stress-induced inflammation**

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Endoplasmic reticulum (ER) stress has been observed in neurodegenerative disease. ER stress is instigated by improperly folded proteins within the ER resulting in the activation of the unfolded protein response (UPR) and inflammatory signaling pathways. The mechanisms behind these pathways are largely unspecified. The UPR evolves acclimating and apoptotic signals to mitigate cellular distress. Recently, ER stress has been observed to initiate JAK1-dependent phosphorylation of the transcription factors STAT1 and STAT3. This report aims to address two questions: Does JAK2 respond to ER stress? Do STAT1 and STAT3 mediate ER stress-induced inflammatory genes? siRNA treatments were used to reduce JAK2, STAT1, and STAT3 protein synthesis, and, coupled with RT-qPCR analysis, yielded multiple findings: 1) JAK1 and JAK2 have different functionalities 2) STAT1 and STAT3 seem to not be responsible for the up-regulation in inflammatory gene expression. These data suggest that JAK2 signals via a novel, but currently unknown, transcriptional pathway to modulate inflammatory gene expression. Future research will aim toward mapping this signaling mechanism in hopes for the development of therapeutic regulators of chronic inflammation.
**Bio & Health Sci. Poster 19:**

**Different dilutions of odor elicit specific neurophysiological responses in *Manduca sexta***

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

When an animal detects an odor, its olfactory representation varies and is dependent upon the identity and concentration of the odor. Antennal lobe representations should produce a greater spatial response in correspondence with increasing concentration of odor. Using the moth *Manduca sexta* as a model, discrimination and detection thresholds of various significant odors were obtained, followed by electrophysiological analysis of the moth's glomeruli to visualize the response to the odor at a neurophysiological level. A detection threshold of 0.1 ug/2 ul and discrimination threshold of 1.0 ug/2ul were found for each odor tested. Additionally, Euclidean distance analysis showed more time is required for the animal to process an odor at discrimination-level concentration than at threshold-level concentration, indicating there is more spatiotemporal information present at discrimination than at detection. Electrophysiological analysis indicated that across all dilutions, roughly 50% of the glomeruli were activated. When presented with undiluted odor, approximately 66% of glomeruli were activated. These results indicate an increased spatial response produced by the glomeruli is not solely responsible for odor discrimination.

**Bio & Health Sci. Poster 20:**

**Seeding huntingtin aggregation with distinct huntingtin fragments***

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Huntington's Disease (HD) is a genetic, neurodegenerative caused by an expanded polyglutamine domain in the huntingtin (htt) protein. A glutamine expansion greater than 35 repeats results in toxic htt aggregation associated with HD. A common feature of protein aggregation diseases is a process called seeding, in which pre-formed aggregates act as misfolded templates and speed up aggregation. The purpose of this experiment was to understand seeding mechanisms associated with htt. Specifically, the ability of aggregates to seed htt with a variety of polyglutamine lengths and the role of specific domains within htt were investigated. Model htt fragments were pre-aggregated to test their ability as potential seeds. A variety of unaggregated model htt proteins were exposed to these potential seeds and the kinetics of aggregation was evaluated by atomic force microscopy and other biochemical methods. Preliminary data suggests that the synthetic protein aggregates were ineffective seeds. As the seeding phenomenon in htt aggregation is well established, future experiments will alter preparation protocols to develop functional seeds so that mechanistic studies can be performed.
Bio & Health Sci. Poster 21:

Evidence of multiple echo neuron systems and their relation to language lateralization

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Particular cortical pathways in the human brain are responsive to distinct categories of natural sounds (e.g. environmental sounds and animal sounds). Our lab recently reported that this includes a dissociation between animal action sounds (e.g. horse galloping) and animal vocalizations (e.g. dog barking). Surprisingly, areas associated with motor control were also active by one or the other categories of sound. One possibility was that participants were “imagining” the animal while they were listening. In order to explore this possibility, my study, using fMRI, had participants listen to these two categories of sound stimuli and then mimic the sounds using only their vocal tract. The results indicated that there was an overlap in the areas responsive to listening to the respective categories of sound as well as mimicking the sound, providing the first evidence for the presence of Echo Neuron Sub-Systems, and both lateralized to the left hemisphere. This is significant as it could be reflective of a primitive form of pre-lingual communication processing, which could have important implications for individuals with spoken language disorders.

Bio & Health Sci. Poster 22:

Rx gene knockdown and optic vesicle formation in organoid cultures

Allison Murphy, Helen Rodgers, Peter Mathers

Sensory Neuroscience Research Center, WVU School of Medicine, Morgantown, WV

Embryonic stem cell-derived 3D-organoid cultures provide opportunities for rapidly studying gene function during development. We used mouse embryonic stem cells that were modified to express GFP within retinal tissue to grow optic vesicles in 3D culture. Using Vivo-morpholinos, we performed an antisense knockdown of the Rx gene (which is important for eye development) to explore its effects on early optic vesicle formation in these organoids. As a control, we used control and GFP knockdown morpholinos. We studied the effects of the knockdowns using immunofluorescence on sections of the organoids. We examined expression of Pax6, Mitf, and Pax2, which are related to the early development of the optic vesicle and optic stalk, as well as GFP and activated-Caspase 3. We hypothesized that there would be changes in the expression of retinal proteins in response to the Rx knockdown but little change in the control and GFP knockdown aggregates. This enables the characterization of regions of the developing eye in these organoids and can lead to future studies on the genetics of eye development.
**Bio & Health Sci. Poster 23:**

**Effects of JNK activity on postnatal laminar positioning of cortical interneurons**

Kathryn A. Baker\(^3\), Abigail K. Myers\(^{1,2,3}\), Eric S. Tucker\(^{1,3}\)

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After traveling tangentially to reach the cerebral cortex, cortical interneurons turn, migrate radially, and segregate into one of its six layers. Perturbations to cortical interneuron migration may result in laminar rearrangements that lead to debilitating neurological diseases such as schizophrenia, autism and epilepsy. Our laboratory identified the c-Jun N-terminal kinase signaling pathway (JNK) as a major regulator of cortical interneuron migration in vivo, demonstrating that conditional deletion of Jnk1 in Jnk2 knockout mice delays the initial entry of cortical interneurons into the cerebral cortex. In this study, we evaluated whether delays seen in the embryonic migration of cortical interneurons in Jnk-deficient mice would lead to cyto-architectural changes in postnatal day 21 cortices. We examined the laminar distribution of cortical interneurons using cryosectioning, immunocytochemistry, and confocal imaging. Although no significant differences were noted between controls and Jnk1 and Jnk2 mutant mice, future experiments will focus on deducing the importance of JNK signaling at later time points and in other cortical regions. These efforts could provide mechanistic insight into the developmental etiology of neuropsychiatric diseases.

**Bio & Health Sci. Poster 24:**

**TNF-alpha induced secretion of exosomes containing miRNA-34a decreases mitochondrial function**

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Increased levels of TNF-alpha in serum (0.01 ng/ml) have been correlated with worse clinical outcomes post-stroke. Moreover, in experimental stroke models, TNF-alpha increases infarct size. TNF-alpha induces NF-kappa \(\beta\), while microRNA-34a expression can be increased through NF-kappa \(\beta\) activation. Our lab has shown that miRNA-34a and TNF-alpha decrease neuronal mitochondrial function. Thus prompting the question, does miRNA-34a mediate TNF-alpha induced mitochondrial dysfunction? We exposed a hippocampal neuronal cell line (HT-22) to 0, 0.01, 1, and 10 ng/mL of TNF-alpha for 24 hours and measured expression of miRNA-34a in secreted exosomes. Exposure to 1 and 10 ng/mL of TNF-alpha resulted in a significant increase in miRNA-34a expression \((p < 0.05)\). Next we treated naïve HT-22 cells with secreted exosomes from TNF-alpha treated HT-22 cells and measured mitochondrial function. After 1.5 and 3 hours, the secreted exosomes from TNF-alpha treated cells, resulted in a significant dose dependent decrease in mitochondrial function \((59\%\) and \(62\%\) decrease ATP production for 1.5 and 3 hours at 10 ng/mL). These data argue that TNF-alpha, a pro-inflammatory cytokine, compromises mitochondrial function by increasing expression and secretion of miRNA-34a. Understanding these mechanisms may allow for future therapeutic interventions in stroke and other neurodegenerative diseases involved with mitochondrial dysfunction.
**Bio & Health Sci. Poster 25:**

**Analysis of a regulatory mutation in Drosophila protein kinase CK2**

Yasamin Samadi and Ashok P. Bidwai

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CK2 is an enzyme that modifies other proteins through the attachment of phosphate groups. This enzyme, which is found in all eukaryotes, is essential for life, and its aberrant regulation is associated with cancer. How this enzyme is itself regulated is unclear. The evolutionarily conserved nature of CK2 is best illustrated by the finding that the lethality of yeast cells deleted for CK2 genes is rescued by the CK2 genes from Drosophila or humans. This study sought to analyze a mutation that changes a highly conserved Lys residue to Arg. Through the use of an inducible (GAL1/10) promoter, mutants of Drosophila CK2 were tested with either Lys or Arg in the yeast rescue bioassay. The results indicate that the Lys residue, thought to be the site for attachment of the regulatory protein Ubiquitin, controls CK2 levels in a cell. Also of interest are the effects of a Lys residue in place of the wild type Arg in the corresponding CKA1 gene found in *S. cerevisiae*, which is currently under investigation.

**Bio & Health Sci. Poster 26:**

**Ascending mechanosensory pathways in the brain of Drosophila melanogaster**

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The fruit fly, *Drosophila melanogaster*, offers a number of experimental tools for manipulating gene expression and visualizing neurons, making it an ideal model system for studying the structure and function of neural pathways. In *Drosophila*, one of the first brain regions that processes mechanosensory stimuli, such as wind, vibration, and sound, is the antennal mechanosensory and motor center (AMMC). A higher brain center, the mushroom bodies (MB), is best studied for its role in olfactory learning and memory, but responds to other senses, including mechanosensation. So while the AMMC is responsible for the initial processing of mechanosensory stimuli we do not know the pathways that carry mechanosensory information to higher brain regions for integration with other senses. We use flies that contain a transcriptional reporter for intracellular calcium (TRIC), which will express a fluorescent label in neurons activated by sensory stimuli. Flies will be exposed to a constant wind stimulus, and the responding neurons visualized using a confocal (fluorescent) microscope. Mechanosensory pathways in the brain will be identified by fluorescent labeling of their constituent neurons.
**Bio & Health Sci. Poster 27:**

**The effects of the CK2 inhibitor CX4945 in an orthotopic mouse tongue tumor model**

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Head and neck squamous cell carcinoma (HNSCC) is a health disparity in West Virginia in relation to the rest of the U.S. and has limited targeted therapeutic options. The casein kinase 2 (CK2) inhibitor, CX4945, is currently undergoing clinic trials for efficacy in other cancers. CK2 phosphorylates the scaffolding protein cortactin, altering actin dynamics necessary for invadopodia formation. Invadopodia are cellular protrusions that degrade the restrictive basement membrane and stromal extracellular matrix (ECM) facilitating HNSCC invasion and metastasis. Invasive HNSCC cell lines were orthotopically injected into the tongues of immunocompromised mice then administered CX4945 as the treatment or DMSO as the control. Tongues were evaluated for locoregional invasion and lymph nodes for metastasis. HNSCC tumor invasion and growth were monitored using in vivo imaging system (IVIS), followed by histological evaluation with hematoxylin and eosin, and immunofluorescence staining. CX4945 is expected to reduce HNSCC invasion within the tongue and lymph node metastasis. These data suggest a novel therapeutic intervention for improving HNSCC patient outcome.

**Bio & Health Sci. Poster 28:**

**In vitro activity of common operating room materials against Staphylococcus aureus biofilm**

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Although rare, total joint arthroplasty prosthetic joint infections (PJIs) caused by biofilm formation result in substantial physical, emotional, and financial burdens for patients. Recent studies have demonstrated the ineffectiveness of the common technique of irrigation and debridement in controlling PJI. Additional methods of removing pathogenic biofilm need to be explored. The purpose of this study is to evaluate the efficacy of common materials (chlorine dioxide, 10% povidone-iodine, Dakin’s solution, and 3% hydrogen peroxide) in removing bioluminescent *Staphylococcus aureus* Xen36 biofilm from various arthroplasty materials, including titanium and stainless steel. *S. aureus* biofilm was cultured on 1cm² coupons for 48h, which were subsequently treated with four concentrations of each treatment. Qualitative and quantitative data were collected using a photon collection camera (Xenogen IVIS 100), which visualizes the bioluminescence of biofilm mass. Average biofilm radiance (photons/s/cm²/sr) before and directly after treatment was $10^4$, and 18h after treatment was $10^3$, yielding average 70% killing efficacy. The current results demonstrate no significant difference between treatments, however this may be due to the limited sensitivity inherent to the IVIS system.
Biological and Health Sciences Category

**Bio & Health Sci. Poster 29:**

The innervation status of antennal lobe glomeruli by the csd neuron in *Drosophila melanogaster*

Cole T. Michael, Kaylynn E. Coates & Andrew M. Dacks

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The antennal lobe of *Drosophila melanogaster* serves as a well-characterized, olfactory processing circuit. Depending on the internal state of *Drosophila*, the olfactory system can become more tuned to a particular stimulus by neuromodulators, such as serotonin (5-hydroxytryptamine). 5-HT is provided to the *Drosophila* antennal lobes solely by the CSD neurons. However, little was previously known about the synaptic distribution to different glomeruli by the CSD neuron. To answer this question, we utilized fluorescent pre-synaptic markers to map the vesicular fusion between the CSD neuron and various glomeruli. This was accomplished by tagging the transgenic protein “brp-short”, which colocalizes to the cellular membrane along with endogenous vesicle docking machinery. Confocal microscopy was used to scan the *Drosophila* antennal lobe to quantify the fluorescent puncta, which are indicative of CSD neuron presynaptic sites. We found that in most glomeruli the number of CSD synaptic sites were highly consistent, however some glomeruli produced a variable amount of active zones between animals.

**Bio & Health Sci. Poster 30:**

Dynamic conformations of PAN coiled-coils and their effect on proteasome activity

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The proteasome has been indicated to have an important role in many neurodegenerative diseases and cancers, usually being that it is not active enough or too active. Therefore understanding the regulation of the proteasome may be vital to curing such diseases. Proteasome Activating Nucleotidase (PAN) is an archaeal homologue to the eukaryotic 19S subunit of the proteasome. This subunit is able to regulate the activity of the proteasome because it must unfold the proteins before they can be degraded. PAN has three coiled-coil domains that are known to have regulatory properties. The goal of this research is to determine the dynamic conformations of these coiled-coils along with each conformation’s effect on activity. The conformations are determined by locking the coiled-coils into position with disulfide bonds formed between cysteine mutations. The role of each conformation is determined by observing any change in enzymatic activity when the coiled-coil is locked in position. The coiled-coils have been found to exist in three different conformations and locking them in those positions separates its activity from its energy use.
Determining the role of \textit{Jnk3} in the migration of cortical interneurons during development

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During embryonic development, cortical interneurons migrate tangentially from the ganglionic eminences to the cerebral cortex. Deficits in this process may lead to severe neurodevelopmental disorders, including autism, epilepsy, and schizophrenia. Therefore, elucidating molecular mechanisms underlying the tangential migration of cortical interneurons are of great clinical importance. Previously, our laboratory determined that \textit{Jnk1}, a member of the c-Jun-N-terminal kinase (JNK) signaling pathway, is essential for the initial entry of cortical interneurons into the cerebral cortex, while a related family member, \textit{Jnk2}, is not. In this study, we evaluated the role of \textit{Jnk3} in cortical interneuron migration. We employed cryosectioning, immunostaining, and confocal imaging to analyze the migration of cortical interneurons in \textit{Jnk3} knockout embryos and their heterozygous littermate controls. Our data suggests that \textit{Jnk3}, similarly to \textit{Jnk2}, does not play an obligate role in tangential migration. Moving forward, we will determine whether the deletion of \textit{Jnk3} with \textit{Jnk1} and/or \textit{Jnk2} exacerbates migratory deficits. This will help resolve the contribution of \textit{Jnk3} to cortical development and also improve our understanding of how diseases of cortical connectivity arise.
**Agricultural and Environmental Sciences Category**

**Ag & Env Sci Index:**

**Poster 1:** Impact of fruits and vegetables on cholesterol levels of at risk young adults. Jacqueline Quispe, Oluremi Famodu & Melissa Olfert.

**Poster 2:** Synthetic DL-methionine effects on performance of organically reared broilers and subsequent environmental impact. M. L. Michael, S. N. Fedorke & J. S. Moritz III.

**Poster 3:** Intravenous nicotinic acid infusions: suppresses adipose tissue lipolysis in Holstein dairy cattle. Jessica Leigh Clegg & J. W. McFadden.

**Poster 4:** RNA-seq reveals differential gene expression in abomasal lymph node during Haemonchus contortus infection. Jessica Keenan, Javier Garza & Scott Bowdridge.

**Poster 5:** Recovery of sarcoplasmic protein from silver carp at various stages of protein recovery pH shift process. Jordan Garry, Derek Warren, Ilgin Paker & Kristen Matak.

**Poster 6:** The effects of rumen-protected methionine, choline, and betaine supplementation on metabolic health and milk production in periparturient dairy cows. Hannah Bailey, Sina Samii, Yu Zang & Joseph McFadden.

**Poster 7:** Toxicity of copper sulfate and cellulosic copper nanoparticles in Saccharomyces cerevisiae isolates. Catherine Blackwood, Lyndsey Weatherly & Jennifer Gallagher.

**Poster 8:** Synthetic DL-methionine effects on performance and cytokine expression of organically reared broilers. S. N. Fedorke, M. L. Michael & J. S. Moritz.


**Poster 10:** Investigation of dihydroergot alkaloid biosynthesis. Stephanie Arnold & Daniel Panaccione.

**Poster 11:** Self-sustaining production of Miscanthus x giganteus in West Virginia climate. Jordan Masters & Eugenia Pena-Yewtukwi.

**Poster 12:** Mean leaf angles of central Appalachian tree species: measurements from five fire towers. Evelin Flamenco, Samuel Rescorl & Brenden McNeil.

**Poster 13:** Effects of multiple-pollutant interactions on water quality in the West Run Watershed. Nicole Hegele, Karen Buzby & Lian-Shin Lin.

**Poster 14:** Managing soil to decrease urban heat. Daniela Maria Tavares, Débora Bonacina & Eugenia Pena-Yewtukwi.

**Poster 15:** Context Dependent Effects of Cannabinoids. Avery Gookin, Brandon Neeley & Gary Marsat.
Agricultural and Environmental Sciences Category

**Poster 16:** *The impact of stressors on cell growth and glycogen synthesis in cyanobacteria.* Robert Flinn & Jonathon Cumming.

**Poster 17:** *Miscanthus x giganteus as a sustainable vegetative cover in buffer strips.* Rogério Flores Jr., Bianca Fernandes Darissi & Eugenia Pena-Yewtukiw.

**Poster 18:** *An innovative study of endocrine disruption in individual zebrafish.* Paige Reed, Vincent Nyakubaya, William Feeney, Amber Kantes, Regina Rockwell, Lisa Holland & Jennifer Ripley Stueckle.
Ag & Env Sci Poster 1:

Impact of fruits and vegetables on cholesterol levels of at risk young adults

Jacqueline Quispe, Oluremi Famodu, Melissa Olfert

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Due to the increasing prevalence of obesity and cardiovascular disease (CVD), many young adults are at risk for metabolic syndrome (MetS), which presents a need for interventions to improve the health of the population. The purpose of this study is to analyze how a fruit and vegetable diet on cholesterol levels impacts young adults at risk of MetS. An 8-week dietary intervention with thirty-six (male=16; female=21) "at risk" college-aged students were recruited. It followed the 2010 Dietary Guidelines for Americans with pre and post measurements, which include blood, anthropometrics, and surveys. Of the male participants, total cholesterol significantly decreased (p <0.01) from 185.1 (27.9) mg/dL to 169.7 (30.5) mg/dL, and low-density lipoprotein (LDL) trend decreased from 115.4 (19.6) mg/dL to 107.5 (23.2) mg/dL. Female participants total cholesterol slightly increased from 173.0 (26.8) mg/dL to 175.7 (25.3) mg/dL, and LDL levels increased from 95.0 (19.5) mg/dL to 99.7 (22.0) mg/dL. This indicates that a fruit and vegetable diet has a greater improvement in younger males cholestres levels from pre to post intervention compared to females.

Ag & Env Sci Poster 2:

Synthetic DL-methionine effects on performance of organically reared broilers and subsequent environmental impact

M. L. Michael¹, S. N. Fedorke¹, J. S. Moritz III²

¹Organic Agriculture Research Farm, ²Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506

Synthetic DL-methionine has been used in conventional poultry production due to least cost diet formulation and contributions to optimal broiler chicken performance. DL-methionine use has been criticized due to its method of production. Economically feasible alternatives are currently under investigation. Environmental impacts are critical in evaluating alternative feeding strategies. This study assessed performance and litter composition as a measure of environmental impact of organically reared broilers fed diets varying in DL-methionine and crude protein content. Cost of commercial diet formulation was also determined. Birds were reared at the WVU Certified Organic Research Farm. Dietary treatments consisted of varying DL-methionine inclusions to diets at either 0.0, 1.0, or 3.6 kg/tonne maintaining crude protein at 20%. A diet was also fed using 0.0 kg/tonne DL-methionine at 24% crude protein. Broiler performance was monitored and litter was assayed for nitrogen as well as total and inorganic phosphorus. Increasing crude protein increased diet cost by $87/tonne. These data in part elucidate ingredient contributions to performance and environmental impact of organically reared broilers.
Ag & Env Sci Poster 3:

Intravenous nicotinic acid infusions: suppresses adipose tissue lipolysis in Holstein dairy cattle

Jessica Leigh Clegg and J. W. McFadden

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

An increase in adipose tissue lipolysis can promote insulin resistance in dairy cattle. Insulin resistance, in turn, causes metabolic diseases, such as ketosis. Inhibiting lipolysis may be a means to reduce disease in cows. To explore this possibility, the effects of nicotinic acid (NA), an anti-lipolytic agent, on lipolysis and serum metabolism were investigated. For this pilot study three (n=3) multiparous non-lactating Holstein dairy cows that were fed ad libitum, fasted, or fasted while intravenously infused NA (5 mg/kg of body weight per hour; delivered every 20 minutes) for 32 hours. Blood was collected at routine intervals. Serum non-esterified fatty acids (NEFA) and glucose were determined colorimetrically; while, gas chromatography-based mass spectrometry (GC/MS) was also utilized to profile serum metabolites with a non-targeted metabolic approach. Results indicate that fasted cows mobilize NEFA, a response completely suppressed by intravenous NA infusions. The significance of the study is that a NA may limit metabolic disease by increasing insulin sensitivity.

Ag & Env Sci Poster 4:

RNA-seq reveals differential gene expression in abomasal lymph node during *Haemonchus contortus* infection

Jessica F. Keenan, Javier J. Garza and Scott A. Bowdridge

Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26505

*Haemonchus contortus* is a blood-feeding parasite of sheep responsible for vast economical losses. St Croix hair sheep possess remarkable resistance to this parasite and can eliminate the parasite very rapidly. Resistance observed in St. Croix sheep is largely thought to be immune-mediated but underlying immunological mechanisms regulating immune responses to this parasite are not well-defined. Thus, the purpose of this study was to use RNA-sequencing technology to determine differences in gene expression between parasite resistant and susceptible sheep breeds. Abomasal lymph nodes were collected 7 days after *H. contortus* infection in 3 St Croix (STC-resistant) and 3 Dorset crossbred (Dx-susceptible) lambs. RNA-seq analysis identified 51 genes differentially expressed between breeds. Specifically, 14 genes were involved in immunological processes, of which 12 were upregulated in Dx lambs. Greater expression of immune-related genes suggests that Dx lambs are beginning to generate immune responses in local lymph nodes by day 7. These data further demonstrate that susceptible sheep generate a delayed immune response to *H. contortus* infection, permitting parasitic establishment.
Ag & Env Sci Poster 5:

Recovery of sarcoplastic protein from silver carp at various stages of protein recovery pH shift process

Jordan N. Garry, Derek Warren, Ilgin Paker, and Kristen E. Matak

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

With fishery overexploitation and protein malnutrition being global issues, we must utilize our resources more efficiently. Most protein recovery processes only look to recover the myofibrillar protein (MP); however, water soluble, sarcoplastic protein (SP) is present in the process water of the pH shift process, and is often discarded. The purpose of this study was to determine which stage of the pH shift protein recovery process would recover the most SP. Carp paste was used in 1:6 water dilution as the starting material. Shifting pH allowed MP and insolubles to precipitate and were collected from process water. A separate fish sample, 1:3 water dilution was homogenized and centrifuged without addition of chemicals. This SP water was removed prior to the pH shift of the remaining insoluble material. Protein recovery yield was 74.92 ±8.16% in the MP without removal of SP dilution, which was the highest (p<0.05) recovery in this study. There was 13.01± 0.96% protein recovery yield from the SP dilution. Therefore, running the pH shift process directly recovers more protein overall.

Ag & Env Sci Poster 6:

The effects of rumen-protected methionine, choline, and betaine supplementation on metabolic health and milk production in periparturient dairy cows.

Hannah Bailey, Sina Samii, Yu Zang, Joseph McFadden

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

Dairy cows transitioning from gestation to lactation often develop fatty liver, a postpartum metabolic disease. The development of fatty liver can negatively impact cow health and performance. Hepatic phosphatidylcholine synthesis is limiting in peripartal dairy cows; therefore, an increase in phosphatidylcholine synthesis may reduce liver steatosis. Because methionine, choline, and betaine are intermediates in the phosphatidylcholine synthesis pathway, our objective was to evaluate the effects of rumen-protected supplement containing these limiting nutrients on transition cow health and performance. Fourteen multiparous Holstein dairy cows received 100 g/d of MecoVit (containing 20 g/d methionine, 10 g/d choline, 3 g/d betaine, and 67 g/d of hydrogenated fat; Vetagro, Italy; n =7) or supplemented (control; 67 g/d of hydrogenated fat). Intake, body weight, body condition, milk yield and composition, and energy balance were evaluated. The implications of our research include the revisal of transition cow feeding strategies to improve animal health while maintaining optimum milk production and quality.
Toxicity of copper sulfate and cellulosic copper nanoparticles in *Saccharomyces cerevisiae* isolates

Catherine Blackwood, Lyndsey Weatherly, and Jennifer Gallagher

*Department of Biology, Eberly College of Arts and Sciences, West Virginia University, Morgantown, WV 26506*

Copper and copper alloys have antimicrobial properties and are toxic to fungi, bacteria, and other living cells, but comprehensive toxicity levels are unknown. This toxicity can be used for the benefit of humans in applications such as preventing bacterial infection, but genetically varied microbes respond differently to copper exposure. Through nanotechnology, cellulosic coppers nanoparticles (c-CuNPs) have been developed that are more toxic than soluble copper sulfate, determined via *Saccharomyces cerevisiae* viability assays. In order to determine the mechanisms of toxicity and resistance, it is important to understand the precise difference in toxicity of soluble copper and c-CuNPs in the model organism, *S. cerevisiae*. Samples of fruits, leaves, and bark extrudes were collected from WVU campuses as well as a variety of rural areas in the state for the purpose of isolating genetically diverse, non-laboratory *S. cerevisiae* strains of yeast. After applying an enrichment protocol, colonies with yeast-like appearance were identified by species using polymerase chain reactions (PCR). These identified strains are subjected to qualitative and quantitative analysis to assess their resistance to copper and c-CuNP.

Synthetic DL-methionine effects on performance and cytokine expression of organically reared broilers

S.N. Fedorke, M.L. Michael, and J.S. Moritz

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

Synthetic DL-methionine has been commonly used in conventional poultry production due to least cost diet formulation and contributions to optimal broiler chicken performance. A growing movement exists to decrease the use of DL-methionine in organic broiler chicken diets due to the methods used to produce DL-methionine that include the combination of toxic compounds such as acrolein and methyl mercapton. In addition, proponents of organic production view DL-methionine as an ingredient that may optimize bird performance but not necessarily bird health. DL-methionine inclusion on performance and immune response are critical in evaluating standards for organic broiler chicken production. Birds were reared at the WVU Certified Organic Research Farm. Dietary treatments consisted of varying DL-methionine inclusions to diets at either 0, 1, or 3.6 kg/tonne maintaining crude protein at 20%. A diet was also fed using 0 kg/tonne DL-methionine at 24% crude protein. Broiler performance was monitored until birds reached market weight. Kidneys were aseptically excised and analyzed for cytokine expression. Data obtained should in part elucidate DL-methionine contributions in organically reared broilers to performance and well-being.
**Ag & Env Sci Poster 9:**

**Characterization of a novel zinc finger protein using molecular genetics techniques**

Kristen Mastrantoni, Jacqelyn Hand, Lei Wang, Ishan Gandhi, and Jianbo Yao

*West Virginia University, Division of Animal and Nutritional Sciences, Morgantown, WV 26506*

Zinc finger transcription factors (ZNF) containing the Kruppel Associated Box domain (KRAB-ZNF) belong to a large, highly conserved class of proteins encoded by eukaryotic genomes. ZNF proteins function as regulators of transcriptional activity by controlling gene expression of important functional processes such as embryonic development. The recent discovery of a novel KRAB-ZNF (ZNFO) specific to the mammalian oocyte has prompted further investigation of its functional role. Two-step PCR mutagenesis was conducted to confirm the predicted nuclear localization site of ZNFO. Immunohistochemistry (IHC) was performed on bovine fetal ovaries to determine the spatial and temporal expression of ZNFO during oocyte development. Moreover, a luciferase assay was conducted to confirm the predicted repressive function of ZNFO. These experiments establish a basic characterization of the novel ZNFO and provide further insight into its function. It is suspected that this novel protein may be a key regulator of embryonic genome activation. Insight into the biological function of the novel ZNFO may enable its use as a biomarker to predict embryonic loss.

**Ag & Env Sci Poster 10:**

**Investigation of dihydroergot alkaloid biosynthesis**

Stephanie L Arnold \(^1\) and Daniel G Panaccione \(^2\)

\(^1\) Biochemistry Program and \(^2\) Division of Plant and Soil Sciences, Davis College, West Virginia University, Morgantown WV 26506

Modification of Fungi has been used for the production of pharmaceutically desired chemicals. In previous studies, an agroclavine producing strain of *Neosartorya fumigata* was altered to produce lysergic acid, a compound used in drugs to aid cognitive function. This was done by expressing the enzyme CloA from a lysergic acid producer. Our objective was to produce a similar but more effective chemical, dihydrolysergic acid using *N. fumigata* and a different CloA derived from a dihydrolysergic acid producing fungus rather than one producing lysergic acid. We hypothesized that expressing CloA from *Claviceps africana*, which produces dihydrolysergic acid, in a festuclavine accumulating strain of *N. fumigata* would result in oxidation of festuclavine to dihydrolysergic acid. A promoter from *N. fumigata* was fused to the CloA coding sequence. The joined sequence was ligated into a plasmid and transformed into the festuclavine producing fungus. After the fungal colonies were grown, alkaloid production was observed. There was no evidence of oxidation from festuclavine to dihydrolysergic acid. This indicates additional genes may be required for CloA to successfully oxidize festuclavine.
**Ag & Env Sci Poster 11:**

**Self-sustaining production of Miscanthus x giganteus in West Virginia climate**

Jordon G. Masters and Eugenia M. Pena-Yewtukiw

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

There is a lack of published information on the factors that affect the sustainable production of biofuel crops. *Miscanthus x giganteus* is a high yielding, cellulosic, biofuel crop with an increasing popularity throughout the world. The objective of this study was to measure the ability of *Miscanthus x giganteus* to drive sustainability. The study’s hypothesis states that there is a dynamic relationship between soil and plant that drives sustainability regardless of initial residual fertility conditions. To test the hypothesis, a *M. x giganteus* experiment planted in 2010 with five residual fertility treatments was sampled to compare plant (vigor and tissue composition) and soil variables (organic material, bulk density, aggregate stability, and nutrients) collected in 2011 and 2015. In 2011 significant difference in plant vigor, bulk density and wet aggregate stability were observed between treatments. However, in 2015 these properties didn’t show significant differences between treatments; dry aggregate stability followed a similar trend. The results support the hypothesis that *Miscanthus x giganteus* influenced soil conditions in time, and as a consequence its own sustainability.

**Ag & Env Sci Poster 12:**

**Mean leaf angles of central appalachian tree species: measurements from five fire towers**

Evelin A. Flamenco, Samual A. Rescorl and Brenden E. McNeil

*Department of Geology and Geography, West Virginia University, Morgantown, WV 26506-6300*

All tree species adapt differently to the environmental conditions of specific habitats and seasons, and these different adaptations affect climate change through their impacts on the global cycles of carbon and energy. The purpose of this study is to identify how one adaptation, mean leaf angle, differs by species. Leaf angle is relatively understudied, but can have an affect on different intensities of albedo, photosynthesis, and water loss through the leaves. For this study we climbed five fire towers in the Central Appalachian Mountains, took level pictures of the upper canopy of trees, and used the pictures to measure the angle of the tree leaves. Our first round of images taken in early June produced 2720 leaf measurements, and revealed statistically significant differences among 12 tree species. Future monthly measurements will examine how these differences persist or change through the growing season to describe this important adaptation of tree species.
**Ag & Env Sci Poster 13:**

**Effects of multiple-pollutant interactions on water quality in the West Run Watershed**

Nicole Hegele, Karen Buzby, and Lian-Shin Lin

*Department of Civil and Environmental Engineering, West Virginia University, Morgantown, WV 26506*

Contamination due to acid mine drainage (AMD) and nutrient-laden wastes in the West Run watershed have deteriorated water quality and prevented human recreation. This study aims to assess various pollution sources and investigate how their interactions affect pollutant export. Water quality along the main stem only meets regulations for recreation between Ackerman Road and the confluence. Two tributaries are impacted by AMD. In particular, the Pines tributary displays high concentrations of iron, (8.7 mg/L), aluminum (7.5 mg/L), and phosphate (0.15 mg/L), approximately 200 m above its mouth. Downstream, these levels decrease to 5.40, 6.28, and 0.06 mg/L respectively. While these concentrations change proportionally, sulfate concentrations remain almost constant, indicating no dilution. This indicates precipitation formation of AMD coagulants (Fe, Al) with phosphate. Mass loading of sulfate (40 mg/s) at the confluence to Monongahela River exceeds the estimated value (14 mg/s), indicating failure to sample all AMD inputs. Burroughs Run is not contaminated by AMD, but found with algal growth. These results provide evidences that interactions can mask water quality impacts of individual contaminant.

**Ag & Env Sci Poster 14:**

**Managing soil to decrease urban heat.**

Daniela Maria F. Tavares¹, Débora Y. Bonacina², Eugenia M. Pena-Yewtukiw³

*Department of Civil and Environmental Engineering, ¹Federal University of Paraiba, Brazil, ²State University of Mato Grosso do Sul, Brazil, ³Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26505*

Climate change is affecting our everyday life. In urban areas evidence of climate change generated by human activities is expressed as heat islands. Different methods to reduce heat island have been achieved by reducing the flux of energy through building shells via engineering methods. This study’s objective is to measure the effect of atmospheric temperature on changes in soil and canopy temperature as related to soil quality. The study’s hypothesis is that soil quality can be managed to mitigate surrounding temperatures in nearby areas. Surface soil (0-5cm) and canopy temperature were measured daily in an experiment consisting of five soil quality treatments, and one vegetative cover (Miscanthus x giganteus). Temperature measurements showed significant correlation (r between 0.9 and 0.97) between atmospheric and canopy temperature. Soil and canopy temperature were always 1 to 2 °C below atmospheric temperature. Higher soil quality was consistently related to lower soil and canopy temperatures. Our data provide evidence to support environmental cooling potential of soil and canopy due to evaporative cooling enhanced by increased soil quality.
Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 15:

Context Dependent Effects of Cannabinoids

Avery Gookin, Brandon Neeley, Gary Marsat

Biology Department, West Virginia University, Morgantown 26506

Cannabinoid receptors are found throughout the brain where they are the main retrograde synaptic transition mechanism. There is still little known on their role sensory processing in a healthy or a diseased organism. The Brown Ghost Knife fish, a weakly electric fish was chosen to establish a model organism for sensory processing, by studying the effect of cannabinoids on behavior. More specifically, the aim was to determine if the behavioral effects are context dependent. In order to accomplish this goal groups of four fish were either injected with only THC or only the vehicle (control). The fish were either placed in a novel environment with unknown peers, or in a familiar environment with other fish from the same tank. It was discovered that communication behavior (amount of chirping), movement, and clustering (tendency to stay in a group) is influenced by THC in a context dependent manner.

Ag & Env Sci Poster 16:

The impact of stressors on cell growth and glycogen synthesis in cyanobacteria

Robert J.C. Flinn and Jonathan R. Cumming

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Cyanobacteria are responsible for creating a large amount of the atmospheric oxygen that makes life on this planet possible. It is for this reason that they play such a large role in the global checks and balances that keeps the global ecosystem running. When exposed to stressors such as: high salinity levels, low pH levels, and heightened temperatures, the cyanobacteria are thrown into a stress response that allows for the cells to survive but slows the photosynthetic process and prevents cell reproduction. These three stressors are all results of human impact on the global ecosystem. This stress response would result in a global rise in the ever growing ambient CO$_2$ levels. His would result in even higher global temperatures and ultimately the failure of life on this planet. The growth of the cells can be calculated through spectrophotometer readings which shows the absorbance of the thylakoid layer of these bacteria in a certain sized sample and can be compared to their normal growth curve. This shows how well the bacteria acclimate to the stressors.
Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 17:

Miscanthus x giganteus as a sustainable vegetative cover in buffer strips.

Rogério Flores Jr¹, Bianca Fernandes darissi², and Eugenia M. Pena-Yewtukiw³

¹Tecnological department of Umuarama, State University of Maringá, Brazil
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³Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506

Buffer strips is a management practice commonly used to control air, soil, and water quality. Soil, topography, vegetation and weather will affect the efficiency of buffer strips. Grass is the standard vegetation for sediment and pollutant control, however the use of Miscanthus x giganteus as vegetative material may provide the additional benefit of cellulosic biofuel stock. The objective of this study was to measure the effect of M. x giganteus and grass, on soil saturated hydraulic conductivity (Ksat) and water retention. The study’s hypothesis is that M. x giganteus plantation will improve soil properties and water movement more effectively than well established grass. Soil surface bulk density, Ksat, and water retention were measured in five year managed M x giganteus plantation and in 15 year grass plots. In general, Ksat ranged between 0.12cm/min (unmanaged) and 0.5cm/min (managed) M x giganteus plots; managed M x giganteus exhibited the highest Ksat (almost twice grass Ksat). A five year M x giganteus plantation has higher potential of conducting water in saturated conditions than a fifteen year established grass.

Ag & Env Sci Poster 18:

An innovative study of endocrine disruption in individual zebrafish

Paige A. Reed¹, Vincent T. Nyakubaya¹, William J. Feeney¹, Amber D. Kantes¹, Regina Rockwell², Lisa A Holland¹, Jennifer Ripley Stueckle²

¹C. Eugene Bennett Department of Chemistry, ²Department of Biology, West Virginia University, Morgantown, WV 26506

Aquatic exposure experiments with endocrine disrupting chemicals are utilized to elucidate negative health effects and to model toxicity. However, current studies are based on reproductive endpoints and the vitellogenin biomarker of intersex fish, which provide little information on the mechanism of endocrine disruption. Looking at the changes in circulating steroid levels provides more information about potential mechanisms of endocrine disruption. Using a recently reported method involving capillary electrophoresis, UV-Visible absorbance detection, and pH mediated stacking, seven steroidal compounds are quantified with nanomolar limits of detection from five microliters of zebrafish blood. When reproductively active zebrafish were exposed to 17α-ethinyl estradiol at concentrations ranging from 2ng to 32ng/L of tank water, according to OECD guidelines, circulating levels of 17α-ethinyl estradiol were detected. Egg production decreased and vitellogenin levels increased in males. Levels of circulating estradiol increased with increasing 17α-ethinyl estradiol doses for males, revealing that circulating levels of 17β-estradiol levels can be used as a biomarker for endocrine disruption in male zebrafish.
Physical Sciences and Engineering Category

**Phys Sci & Eng Index:**

**Poster 1:** N-N bond cleavage through transition metal catalysis. Nima Ronaghi, Yu Zhang, Brett Hakey & Carsten Milsmann.

**Poster 2:** Development of a headspace GC-MS method for organic gunshot residue collected on sampling media. Sydney Brooks, Brittany Yeager & Suzanne Bell.

**Poster 3:** The total synthesis of aurantioclavine and cycloclavine. Yilin Zhang, Ian McArdle & Björn Söderberg.

**Poster 4:** Effects and relevance of feather porousness on bird aerodynamics. Wade Huebsch & Evan Paden.

**Poster 5:** Feature detection in the medium-wave infrared band. Benjamin Wilson & Thirimachos Bourlai.

**Poster 6:** Kinetic simulations of magnetic reconnection at Earth’s magnetic field. Christopher Doss & Paul Cassak.

**Poster 7:** Star centroiding for on-orbit calibration of the optical navigation camera for NASA’s orion vehicle. Torli Bush, Frank Notarnicola & John Christian.

**Poster 8:** Understanding copper-catalyzed oxidative decarboxylative coupling through the reactivity of copper benzoates. Katelyn Bustin, Corrie Burlas & Jessica Hoover.

**Poster 9:** Synthesis of 2-(tert-butylamino)-benzothiazole from 2-aminothiophenol, using iron-catalyzed reductive coupling. John Riedesel, Elliot Guerra-Blackmer & Jessica Hoover.

**Poster 10:** Transition metal oxides as non-toxic alternative in thermoelectric power generators. R. Eric Johnson, Xueyan Song, Yun Chen & Cullen Boyle.

**Poster 11:** Cost effective containment of unmagnetized argon plasma using a magnetic bucket in a helicon source. Miguel Henriquez, M. Umair Siddiqui & Earl Scime.

**Poster 12:** Mold making and casting process for avian wing using room temperature vulcanization silicone. Joseph Wong, Jordan Cox & Patrick Browning.


**Poster 14:** Estimating control signals from sparse muscle subsets. Adam Chivers, Oleh Bodilovskyi & Sergiy Yakovenko.

**Poster 15:** Payload construction for the testing of microelectromechanical sensors used in small spacecraft navigation. Roshan Daniel, John Christian, Robert Bishop & Daniel Greenheck.
Poster 16: Optimal design of solar photovoltaic arrays for a given location. Esha Halabe & Debansu Bhattacharyya.

Poster 17: Diagnostic designs for three-dimensional measurements in a helicon plasma source. Julianne McIlvain, M. Ulmair Siddiqui & Earl Scime.


Poster 19: A graph ranking variant in cubes of high dimension. Jordan Almeter, Samet Demircan, Andrew Kallmeyer & Kevin Milans.


Poster 22: Determining how close a network is to being uniformly dense. Sarah Locke, Andrea Trice & Hong-Jian Lai.

Poster 23: Selecting the most points from a lattice while avoiding 1x1 and 2x2 squares. Robert Winslow & John Goldwasser.


Poster 27: Computational modeling of the oxidative coupling of methane in a reactive membrane system. Brent Bishop, Juan Carrasco & Fernando Lima.

Poster 28: Improving the usability and capability of multi-scale carbon capture simulation software. Keenan Kocan, Brian Logsdon & David Mebane.


Physical Sciences and Engineering Category

**Phys Sci & Eng Poster 1:**

**N-N bond cleavage through transition metal catalysis**

Nima Ronaghi¹, Yu Zhang, Brett Hakey and Carsten Milsmann

_Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, West Virginia 26506, United States_

Nitrogen, the most abundant element in our atmosphere, has many important uses in our world. Countless industries, the pharmaceutical industry being the largest, have many potential uses for being able to functionalize different compounds with nitrogen-containing groups. Unfortunately, nitrogen in the atmosphere is hard to functionalize, due to diatomic nitrogen containing a triple bond (~230Kcal/mol). However, attempting to break a nitrogen-nitrogen single bond, such as the N-N bond found in hydrazine, is much easier and provides a reasonable starting point for this long-term project. In our study, we have proposed using various metals, with two different ligand systems (dipp-1,2-bis(aryl-imino)acenaphthene (dipp-BIAN) and N-(3,5-diaryl-2H-pyrrol-2-ylidene)-3,5-diphenyl-1H-pyrrol-2-amines (tetraarylazadipyrromethene)), to cleave the nitrogen-nitrogen bond in diphenyl hydrazine. Cobalt, copper, iron, and nickel are the four main transition metals being used in this project. The mechanism of how the metal-ligand complex is able to actually split the hydrazine bond is still unknown, however the current data, obtained mainly through proton NMR, points to bond-cleavage taking place without any added heat or oxidant.

**Phys Sci & Eng Poster 2:**

**Development of a headspace GC-MS method for organic gunshot residue collected on sampling media**

Sydney Brooks¹, Brittany Yeager², and Suzanne Bell¹,²

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_West Virginia University, Morgantown, WV, 26505_

Traditional analysis for firearm discharge residue (FDR) relies on the detection of gunshot residue (GSR) particles, formed from the metals in the primer. Recently, propellant residues (OGSR) have been proposed as alternative target for FDR detection creating the need for the development of new methods. Most forensic science laboratories are outfitted with gas chromatography mass spectrometers (GC/MS) equipped with headspace testing materials. While typically used for blood alcohol and arson cases, it can be adapted to OGSR making it ideal instrumentation. A library was created of common organic constituents of FDR, including diphenylamine, ethyl centralite, and dibutyl phthalate. Methods were developed for sampling media extraction, thermal desorption, headspace analysis, chromatographic separation and mass spectral identification using selective ion monitoring. Figures of merit were determined and these methods were applied to hand swabs and cartridge cases. While headspace methods were feasible, detection limits were not low enough for typical casework samples; however direct extraction of swabs appears promising. Examples of all analyses and method validation results will be presented.
**Phys Sci & Eng Poster 3:**

**The total synthesis of aurantioclavine and cycloclavine**

Yilin Zhang, Ian McArdle, and Bjorn Söderberg

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506-6045*

Cycloclavine, a chiral organic molecule, and aurantioclavine are both organic molecules isolated from fungi. In this study we focus on the total synthesis of the naturally occurring enantiomers of cycloclavine and aurantioclavine. In the case of cycloclavine, we started with the naturally occurring, and commercially available malonic acid, and in the case of aurantioclavine, we started with the commercially available 2-amino 3-nitrophenol. The main synthesis steps for each compound include a palladium-catalyzed Stille-Kelly coupling reaction involving trimethyl tin, an intramolecular Heck reaction, and a carbon monoxide supported palladium-catalyzed reductive N-heterocyclization. These three steps are where most of the trouble preparing the compounds resided and proved to be the most difficult steps in producing sufficient yields of the two isolated compounds. These compounds have a portion of them known as an indole. Many anticancer and neurological drugs contain indoles within the molecules. There has yet to be determined any biological significance to these molecules, but due to the information stated above, there is hope that these molecules may have biological impact in the future.

**Phys Sci & Eng Poster 4:**

**Effects and relevance of feather porousness on bird aerodynamics**

Wade W. Huebsch and W. Evan Paden

*Benjamin Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26505*

Biomimetics (the imitation of naturally occurring biological structures for the purpose of solving problems) has been a long-standing approach to addressing significant design considerations in many distinct fields. Noise reduction and many other aerodynamic effects present in bird flight have become an ever-increasingly important issue in both military and commercial fields as the sophistication of flight vehicles continues to increase. Characterizing and numerically quantifying the effects of such a sophisticated system will naturally yield many interesting and practical applications for the future of the aerospace industry. As part of a larger project, this research entails specifically outlining and comparing the airflow resistive properties of feathers through a uniquely designed testing prototype. The data collected will be able to help with further computational fluid dynamics (CFD) simulations and will push the boundaries of biomimetics in discovering more and more about how and why certain mechanical adaptations come into play during flight.
Feature detection in the medium-wave infrared band

Benjamin D. Wilson and Thirimachos Bourlai

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While there exist many established methods of face recognition in the visible band, changes in illumination can greatly detract from the accuracy of such methods. Images captured in the medium-wave infrared (MWIR) band are illumination invariant and could allow for the recognition of faces in the most difficult of lighting (shade, nighttime, etc.). In order to recognize faces in the MWIR band, a method must be developed to accurately detect facial features. We propose a method to detect features in the MWIR band using a combination of image filtering, Support Vector Machines (SVMs), and geometric data. Filtering is used to extract the maximum amount of relevant data from each image, while SVMs and geometric data are used to perform localized searches for particular features. The performance of our method is demonstrated on the Pinellas County dataset, yielding 96% accuracy in eye detection using cross validation for 979 test subjects. This level of performance suggests that the proposed method has potential for facial recognition applications.

Kinetic simulations of magnetic reconnection at Earth’s magnetic field

Christopher E. Doss and Paul A. Cassak

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Magnetic reconnection is a process where oppositely directed magnetic fields break and reconnect with each other. This process converts magnetic energy into kinetic energy of the surrounding plasma as the bent magnetic field lines straighten and expel jets of plasma. At Earth’s magnetic field, magnetic reconnection between the interplanetary magnetic field and Earth’s own magnetic field is a major factor in space weather. One configuration of magnetic reconnection at Earth’s magnetic field has strong asymmetries in both magnetic field strength and plasma density as well as a bulk flow of plasma from the solar wind. In a previous study using fluid simulations of plasmas, we found that asymmetries in the magnetic field strength along with a sheared flow cause the reconnection site to drift which decreases the rate of reconnection (Doss et al., submitted to J. Geophys. Res.). This study seeks to determine whether these relations persist in kinetic simulations, a more realistic model of plasmas which better models asymmetries in the density. Applications to reconnection at the Earth’s magnetic field are discussed.
Phys Sci & Eng Poster 7:

Star centroiding for on-orbit calibration of the optical navigation camera for NASA’s Orion vehicle

Torli Bush, Frank Notarnicola, and John Christian

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

Orion, NASA’s next-generation crewed spacecraft, will carry future astronauts to exploration destinations beyond low Earth orbit. The Orion vehicle will use optical navigation (OPNAV) as a back-up system to return the crew to Earth if the primary system fails. OPNAV computes a spacecraft’s location through images of celestial bodies. This work compares two methods for OPNAV to locate stars with subpixel accuracy, which will allow for proper calibration of the navigation camera. The first method partitions images taken by the camera into subsections centered on known star coordinates. An algorithm then calculates the weighted center of intensity (COI) for each subsection; this calculation is similar to that used to find weighted center of mass. The second method, normalized cross correlation, compares each location in the image taking by the camera with a known two-dimensional star intensity template and attempts to find locations of best agreement. Early development and testing of these methods were performed using MATLAB, a scripting language software.

Phys Sci & Eng Poster 8:

Understanding copper-catalyzed oxidative decarboxylative coupling through the reactivity of copper benzoates

Katelyn Bustin, Corrie Burlas, and Jessica Hoover

C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, West Virginia 26506, United States

New C-C bonds can be formed through decarboxylative coupling. This process, however, is not clearly understood. In our study, the catalytic decarboxylative coupling of differently substituted benzoic acids is compared with the decarboxylative coupling of analogous copper benzoate complexes. The benzoic acids and copper benzoates are separately coupled with benzoazole to form phenyl-substituted benzoazoles. These reactions paired together aim to understand the apparent need of the ortho-nitro substituted acid for the decarboxylative coupling to be successful. They intend to identify how the catalytic decarboxylative coupling works. 2-nitrobenzoic acid was used in the catalytic reaction to determine the optimized reaction conditions. The copper benzoate complexes were coupled under similar conditions. The product distributions of the catalytic and copper benzoate couplings were compared to determine if the copper benzoates are intermediates in the catalytic decarboxylative coupling of the benzoic acids.
Phys Sci & Eng Poster 9:

**Synthesis of 2-(tert-Butylamino)-benzothiazole from 2-aminothiophenol, using Iron-catalyzed reductive coupling**

John Riedesel, Elliot Guerra-Blackmer, Dr. Jessica Hoover

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

Benzoxazoles, and other related heterocycles, have many common uses in pharmacology and industry which make their synthesis important. Traditionally, synthesis reactions of benzoxazoles and benzothiazoles use palladium compounds as catalysts. Recent findings by associated group members have illustrated the potential for iron-catalyzed reductive coupling to be used to synthesize urea from tert-Butyl isocyanide. This suggests that a similar mechanism may be used to synthesize benzoxazoles and other related heterocyclic compounds. This is done an iron catalyst, potassium graphite (KC8) as a reductant, tert-Butyl isocyanide, and the aromatic starting material of choice, allowing for selection of desired product. Since Iron is much cheaper than palladium, this novel reaction would be favorable to the traditional ones. Currently, we are investigating the used of aminothiophenol and o-phenylenediamine as starting materials, both creating their respective target products. Initial results suggest that the different reactions, utilizing different substrates, are indeed producing aromatic, possibly heterocyclic compounds at reasonable yields. Further investigation, using alternate starting materials and optimizing conditions is planned at this time.

Phys Sci & Eng Poster 10:

**Transition metal oxides as non-toxic alternative in thermoelectric power generators**

R. Eric Johnson, Xueyan Song, Yun Chen, Cullen Boyle

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

Current combustion engine designs are inefficient and lead to loss of energy through waste heat. This lost energy can be partially recovered through the use of thermoelectric generators, but current commercial designs are based on toxic, scarce, low temperature range materials. These problems are addressed with the use of transition metal oxides, but challenges in device efficiency arise. Manipulation of the variables in product development were studied as ways of increasing device efficiency. The focal point of this summer project was the amount of time the material was held at sintering temperature. Sintering is the process of taking a pressed pellet and using heat to fuse together the transition metal oxide particles. A baseline of 2 hours at 1100°C was used to compare with a 9 hour sintering time, also at 1100°C. Results and a conclusion have not yet been formulated at the time of writing this abstract, but will be ready upon poster presentation.
**Phys Sci & Eng Poster 11:**

**Cost effective containment of unmagnetized argon plasma using a magnetic bucket in a helicon source**

Miguel Henriquez, M. Umair Siddiqui, and Earl Scime

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

With the study of interstellar media being a goal of plasma physics, our objective is to be able to design an effective experiment that can study space plasmas at a fraction of the cost of larger and more energy consuming experiments. To demonstrate this, we aim to produce highly-ionized, unmagnetized plasmas, such as in space, using our low-power Compact HElicon for Waves and Instabilities Experiment (CHEWIE) at West Virginia University. Helicon sources naturally produce highly ionized and magnetized plasmas, so we will inject our plasma into a central chamber called the “magnetic bucket”. This chamber is lined with plate-mounted, high-strength magnets that will create local magnetic fields at the edges of the chamber. Using a Langmuir probe, we will measure the density and temperature of the plasma and compare it to a neutral profile in order to deduce an ionization fraction. Helicon plasmas and magnetic containment devices are not uniquely significant to our experiment, but our aim is to work towards broader accessibility and affordability to experiments of this scope.

**Phys Sci & Eng Poster 12:**

**Mold making and casting process for avian wing using room temperature vulcanization silicone**

Joseph W Wong, Jordan A Cox, Patrick H Browning

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

The differences in flight performance in fixed-wing aircraft versus that of an avian wing are numerous, but this study focuses on the individual motion of the feathers. These feathers move and fluctuate with the airflow over the upper and lower surface of the wing. To compare the differences in flight performance between a natural wing and a wing with the exact shape and size, both macroscopically and microscopically, that does not fluctuate with the airflow; an exact copy must be rendered of an original-biological wing. In order to accurately fabricate a one to one scale model of a wing, a molding and casting process using a room temperature vulcanization (RTV) silicone rubber is used to create a mold for an exothermic casting resin that is able to pick up the fine level of detail in the ridges of the feathers. With the mold and casting process perfected, flight data can then be collected to determine if dynamic feathers are a viable option in the industry to increase the performance of modern aircraft.
**Phys Sci & Eng Poster 13:**

**Incorporating energy dependent secondary electron emission coefficients in simulations concerning capacitively coupled plasmas**

M. Daksha¹, A. Derzsi², I. Korolov², E. Schuengel¹, Z. Donko², J. Schulze¹

¹Department of Physics, West Virginia University, 26506, West Virginia, USA
²Hungarian Academy of Sciences, Hungary

Capacitively coupled plasmas (CCPs) are utilized to manufacture technical devices such as solar cells and integrated circuits. The plasma is modeled by kinetic simulations known as Particle in Cell/ Monte Carlo simulations (PIC/MCC). However, unrealistic assumptions about the nature of secondary electron emission coefficients (γ coefficients) are made. For example, it is widely considered that secondary electrons are only induced by ions. Furthermore, the surface conditions of the electrodes and the energy of ions are disregarded. In reality, these factors play a key role in changing the γ coefficient. Therefore, we modify these simulations to take realistic, energy dependent γ coefficients into consideration. We show that utilizing these realistic coefficient leads to a significant change in the predicted nature of the plasma. For example, heating mode transitions in single frequency 13.56 MHz CCP discharges happen at much later pressures. In addition, in a dual frequency CCP discharge with driving frequencies of 2 and 27 MHz, the independent control over the ion flux and mean ion energy is shown to be sensitive to these changes.

**Phys Sci & Eng Poster 14:**

**Estimating control signals from sparse muscle subsets**

Adam Chivers¹, Oleh Bodilovskyi², and Sergiy Yakovenko³

¹Benjamine M. Statler College of Engineering and Mineral Resources, WVU, ²Kyiv Polytechnic Institute, NTUU, and ³Center for Neuroscience, WVU, School of Medicine

Recent developments of dexterous prosthesis for limb amputees require reliable control signal. One source of such signals is from spared muscles above the injury. The challenge is then to identify the most informative muscles that would convey volitional signals for hand movements in most common daily tasks. A method is needed to predict important missing control signals in injured individuals that have a sparse source of signals. We have developed this method based on the dimensionality reduction techniques of PCA and NNMF, as well as k-means clustering, to analyze common signals, also known as synergies, in EMG recordings during the modified Action Research Arm Test. Four statistically significant synergies were identified with both PCA and NNMF, explaining 66% and 68% variance in the dataset, respectively. Clustering of NNMF synergies were found to be less consistent than PCA synergies. The existence of distinct synergies obtained through PCA suggests viability of this approach. Further development will focus on using these synergies to predict activity of missing muscles.
Payload construction for the testing of microelectromechanical sensors used in small spacecraft navigation

Roshan P Daniel¹, John Christian¹, Robert H. Bishop², Daniel Greenheck²

¹Applied Space Exploration Laboratory, West Virginia University, Morgantown, WV 26505
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Space flight is becoming more accessible as a result of the introduction of small satellites (SmallSats). These SmallSats allow universities and smaller businesses to conduct experiments in space for a fraction of the price of large, conventional spacecraft. Due to this democratization of space and the increasing demand for small satellites, there is a need to make smaller navigation systems. Part of a spacecraft’s navigation system is an IMU (Inertial Measurement Unit). An IMU uses a combination of an accelerometer and a gyroscope to track the inertial motion (acceleration and angular rates) of the vehicle, which can be integrated over time to track relative position and orientation. The challenge is that high-quality IMUs aren’t usually suitable for SmallSat applications due to size, weight, power, and cost constraints. To address this challenge, we use a cluster of calibrated microelectromechanical sensors (MEMS) IMUs to achieve performance similar to higher quality IMUs. The current version (Generation 2) of the IMU cluster board will be flown on a sounding rocket as part of a payload designed for NASA’s USIP program. This poster highlights activities completed in the Summer of 2015 to prepare the IMU cluster for launch on the USIP payload. Generation 3 of the board will be flown on a 3U Cubesat developed from a partnership between NASA IV&V, WVU, and ATK.

Optimal design of solar photovoltaic arrays for a given location

Esha B. Halabe and Debangsu Bhattacharyya

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Solar photovoltaic (PV) arrays are at the forefront of renewable energy research; they directly convert sunlight to electricity, thus minimizing pollutant and greenhouse gas emissions. However, work in optimization of PV array design for a given location, with consideration of seasonal and diurnal variation of solar irradiance over an entire year, is minimal in open literature. This project is focused on the development of a non-isothermal model of a PV array, which can be used for model-based optimization of design parameters. The PV array is modeled in MATLAB by a novel seven-parameter, two-diode equivalent circuit. The energy conservation model comprises key energy transfer mechanisms and leverages solar irradiance data from the National Aeronautics and Space Administration (NASA) database. Optimal model parameters are estimated using an interior-point algorithm, regressing with publicly available experimental data. Results show that power output and cell efficiency are maximized when operating temperature is low and solar irradiance is high, which indicates that a combined heat and power (CHP) system will increase efficiency.
**Phys Sci & Eng Poster 17:**

**Diagnostic designs for three-dimensional measurements in a helicon plasma source**

Julianne M. McIlvain, M. Umair Siddiqui, Earl E. Scime

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

Measurements of plasma interactions are very limited. For example, most groups studying plasmas use diagnostics only capable of taking measurements in one or two spatial dimensions. To remedy this issue, we redesigned our plasma flow and temperature diagnostic (called laser-induced fluorescence) to be able to take measurements over the full three-dimensional volume in a laboratory plasma in the HELIX experiment at WVU. We expect this will allow us to measure ion and neutral particle dynamics in an Argon plasma. Such measurements are important to the design of plasma apparatus. For example, experimental fusion reactor walls experience strong ion and neutral fluxes, damaging the experiment structure and preventing their long-term operation. Current models do not take into account the interaction of the wall with both the plasma ions and neutrals. 3D measurements of ions and neutrals in the HELIX plasma source will allow us to investigate how fusion walls are damaged by these complex interactions.

**Phys Sci & Eng Poster 18:**

**Graphical programming method for configurable analog chip**

Jeffrey M. Owens and David W. Graham

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For electronic devices taking input data from sensors and having significant power constraints (e.g. remote sensor applications), analog circuitry can be used to reduce power consumption by performing data preprocessing tasks otherwise left to digital circuitry. A field-programmable analog array (FPAA) meets this need by providing an array of low-power analog components and systems that can be repeatedly user-configured. This also makes such preprocessing tasks achievable with a single chip. Current FPAA programming methods involve the textual mapping of component inputs and outputs within the chip (netlisting). A graphical user interface was created to increase the speed and ease of programming, and to provide a means of simulating the programmed configurations beforehand. FPAA configurations are drawn in the circuit simulation software LTspice and then translated with MATLAB into a FPAA netlist. Placement of internal components can be automated by the program or set manually. The interface currently provides full functionality for FPAA circuit development and programming, and will soon be able to support simulation.
Phys Sci & Eng Poster 19:

A graph ranking variant in cubes of high dimension

Jordan Almeter\textsuperscript{1}, Samet Demircan\textsuperscript{2}, Andrew Kallmeyer\textsuperscript{3}, and Kevin Milans\textsuperscript{2}

\textsuperscript{1}Department of Mathematics, The College of William and Mary, Williamsburg, VA 23185 \textsuperscript{2}Department of Mathematics, West Virginia University, Morgantown, WV 26506, and \textsuperscript{3}Department of Mathematics, Miami University, Oxford, OH 45056

In a graph whose vertices are assigned integer ranks, a path is \textit{good} if the endpoints have distinct ranks or an interior point has a higher rank than the endpoints. A graph ranking is an assignment such that all paths are good. Rankings are well studied and have applications in chip design and certain problems in online algorithms. A k-ranking is a relaxation of rankings in which all paths of length at most k are good. The k-ranking number of a graph, denoted by $\chi_k$, is the minimum number of ranks among its k-rankings. We study the 2-ranking number of the n-dimensional cube, denoted by $Q_n$. Always, $\chi_2(Q_n)$ is at least n+1. For n at most 11, we show that equality holds by constructing optimal 2-rankings of $Q_n$. The construction is based on 1-error-correcting codes. We ask whether $\chi_2(Q_n)$ is equal to n+1 for all n.

Phys Sci & Eng Poster 20:

Cyclic base orderings and uniformly dense networks

Jonathan D. Ashbrock, Rachel K. Gouveia, Hong-Jian Lai

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One of the principle areas of interest in graph theory is analysis of networks and their strengths. Our research looks at a proposed method of determining which networks are uniformly dense. A graph is a collection of points called vertices and lines connecting some pairs of vertices called edges. A cycle occurs in a graph when its edges form a closed loop. A cyclic ordering of the edges of a graph is any way to list all the edges such that the first follows the last. For a network modeled as a graph $G$, we define a quantity $h(G)$ as the largest number of consecutive edges in an ordering where the edges do not form a cycle. Discrete Math., 72 (1988), 187 – 194 conjectures that a connected network $G$ is uniformly dense if and only if $h(G) = n-1$, where n is the number of nodes in $G$. Our research places bounds on $h(G)$ and shows the sharpness of these bounds for a few infinite classes of graphs.
A vertex coloring for a graph $G$ is an assignment of colors to each vertex such that each vertex is colored differently from its neighbors. An $r$-hued coloring is a vertex coloring where for each vertex $v$ with $d(v)$ neighbors, these neighbors are colored with at least $\min\{r, d(v)\}$ different colors. The smallest number of colors necessary for an $r$-hued coloring is $\chi_r(G)$, which has applications to networking and scheduling problems. The degree of a vertex is the number of vertices adjacent to it. The maximum average degree of a graph $G$, $\text{mad}(G)$, is the maximum of the average degrees of all subgraphs of $G$. For planar graphs, it is known that $\chi_2(G) \leq 5$. We proved for all planar graphs, $\chi_3(G) \leq 8$. We also proved that graphs with $\text{mad}(G) < 8/3$ satisfy $\chi_2(G) \leq 4$ unless $G$ is a cycle of length five; graphs with $\text{mad}(G) < 12/5$ satisfy $\chi_3(G) \leq 6$; and graphs with $\text{mad}(G) < 7/3$ satisfy $\chi_3(G) \leq 5$ by the discharge method.

A model of uniformly dense networks has been proposed for secure networks, which is associated with the cyclically base orderings of a graph. We define a quantity $h(G)$ as the largest number of consecutive edges in a cyclic ordering where the edges do not form a closed loop. It has been conjectured in Discrete Math in 1988 that a connected network $G$ is uniformly dense if and only if $h(G) = n-1$, where $n$ is the number of vertices in $G$. Hence, $h(G)$ is considered a measure for how close a network $G$ is to being uniformly dense. In this project, we are to determine all connected graphs $G$ with small values of $h(G)$. So far, we have determined all connected graph $G$ with $h(G) = 1$, and making progresses for $h(G)$ at most 2. We present some graphs with $h(G) = 2$ and lay out further research plans to classify all types of graphs with $h(G) = 2$. 
**Phys Sci & Eng Poster 23:**

**Selecting the most points from a lattice while avoiding 1x1 and 2x2 squares.**

Robert Winslow and John Goldwasser

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

“Turan-like” problems concern finding the maximum number of something within a larger structure such that the creation of some undesirable substructure is avoided. We wished to know the maximum number of points in a lattice that may be selected such that no set of four selected points are located at the corners of a square with side-length 1 unit or 2 units. If the lattice is infinite, then points can be selected with density $\frac{2}{3}$. However, in a finite square lattice, the boundary of the lattice induces conditions which allow additional points to be selected. By breaking the lattice down into 3 by 3 sublattices, treating the sublattices as points on a graph, and defining rules for how these points are connected, we were able to prove that the maximum number of points that may be selected is $(2/3)n^2 + \Theta(n)$. In particular, we have shown that the maximum number of points that may be selected in an $n$ by $n$ lattice lies between $(2/3)n^2 + (2/21)n$ and $(2/3)n^2 + (1/3)n + 2$.

**Phys Sci & Eng Poster 24:**

**Maximum number of points with excluded rectangles in the grid**

William Noland, Robert Winslow, Ethan Gegner, and John Goldwasser

*Department of Mathematics, West Virginia University, Morgantown, WV*

Turán-type problems in mathematics study the maximum quantity of something that may be obtained without creating a certain forbidden configuration. We have considered problems regarding the maximum density of points which one can choose from an infinite grid without choosing all 4 corners of a chosen rectangle of certain dimensions. To exclude a single rectangle of any dimension, both horizontally and vertically, we can always choose $3/4$ of the points on the grid, but no more. The pattern of which points can be chosen depends, amongst other things, on whether the sides are even or odd, or share a common factor. The most interesting patterns result when one dimension is odd and the other even, in which case modular arithmetic generates a diagonal pattern, as opposed to the alternating and/or clustered patterns of other situations. We also have results on excluding various pairs of rectangles, and on three-dimensional variants of the problem.
Physical Sciences and Engineering Category

**Phys Sci & Eng Poster 25:**

**Maximizing configurations in the integer lattice**

Ethan Gegner, John Goldwasser

*Department of Mathematics, West Virginia University, Morgantown, WV 26506-6045*

We consider several Turán-type problems in the integer lattice. In such a problem, one chooses a specific configuration of points in an n by n grid, and tries to determine the maximum number of copies of the configuration over all subsets of the grid. Goldwasser and Hansen showed that for any subset S of an n by n grid, the number of squares whose intersection with S contains exactly 2 points on a diagonal is bounded above by \((n/2)^4\), and that this bound is sharp. We consider bounds for the related problem where the configurations to be maximized are squares with exactly three points included. We present several results in this area and discuss some related problems.

**Phys Sci & Eng Poster 26:**

**The beef with food recognition: a comparison of machine learning techniques**

Nathan Spencer, Marco Piccirilli, Don Adjeroh, Gianfranco Doretto

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

The automatic recognition of food from images is becoming increasingly important in several applications, such as the organization of photo repositories and the automatic monitoring of the calorie intake of patients outside the clinic, often using smartphones. In this work, we leverage a publicly available dataset of food images to deploy, analyze, and compare a number of machine learning classifiers which are able to categorize pictures of dishes into 101 different categories of food. We use multi-class classifiers based on state-of-the-art shallow and deep architectures. Specifically, we use shallow support vector machines with a bag-of-words model and different feature encoding techniques, as well as deep convolutional neural networks (CNNs). Deep models in particular pose significant challenges in that they require large-scale datasets for training as well as remarkable computing power. We overcome those challenges by deploying cutting-edge parallel computing hardware in conjunction with several training strategies. Our best performing model is a CNN that improves classification performance by 40% over the state-of-the-art.
**Phys Sci & Eng Poster 27:**

**Computational modeling of the oxidative coupling of methane in a reactive membrane system**

Brent A. Bishop, Juan C. Carrasco, and Fernando V. Lima  
*Department of Chemical Engineering, West Virginia University, Morgantown, WV 26506*

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

**Phys Sci & Eng Poster 28:**

**Improving the usability and capability of multi-scale carbon capture simulation software**

Keenan X. Kocan, Brian Logsdon, and David S. Mebane  
*Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506*

The Carbon Capture Simulation Initiative (CCSI) is a project that promotes the adoption of carbon reduction technology. CCSI has created a toolset that will allow electric power companies to accelerate the implementation of carbon capture technology in power generation through advanced simulation. Sorbentfit, a component of this toolset, creates a model for an amine-based CO$_2$ sorbent from bench-scale experimental data. This chemical model is then passed to other components of the toolset that model process economics. The Distributed Management Framework (DMF), another component of the toolset, is a web-based application that assists users in monitoring the relationships between data files through the process of sharing them amongst various components of the toolset. This project modified Sorbentfit’s source code in order to integrate it with the DMF. The principal modifications cluster the inputs and outputs of each Sorbentfit run together and marks them with a unique tag. These modifications were developed through consultation with software engineers at Lawrence Livermore National Laboratory. The new version of Sorbentfit was tagged for an upcoming release of the toolset.
Physical Sciences and Engineering Category

**Phys Sci & Eng Poster 29:**

**Finding an intersection between scale space theory and multi-scale 3D modeling techniques**

Sydrake Abdi and Dr. John Christian

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There are numerous methods for modeling and identifying distant objects based on images captured from conventional optical cameras. However, the task of recognizing an observed object is strongly dependent upon how clear the object appears in the captured image. For example, what would something look like if the image were unfocused or had a low resolution? Scale Space Theory is the idea that a unique signal can be represented by a single parameter family of smoothed curves. For example: imagine a deck of cards in which the top card has crisply printed symbols, the bottom card has all of these symbols blurred into a single blob, and every card in between these two represents the incremental evolution from the top card to the bottom card. By combining this theory with 3D modeling techniques, such as mesh subdivision or mesh diffusion, we can find a relationship between the unfocused (or partially resolved) image and the focused (or fully resolved) image. The result is a step forward in improving our ability to model, track, and classify distant objects using passively collected images.

**Phys Sci & Eng Poster 30:**

**LASER studies of combustion chemistry**

Michael Spencer, Juddha Thapa and Fabien Goulay

*Department of Chemistry, West Virginia University*

Fulvenallene has recently been identified as a combustion intermediate in flames, and is thus a species worthy of study. Specifically, it is believed to be a critical intermediate in the formation of polycyclic aromatic hydrocarbons (PAHs). PAHs will associate with one another in flames, and aggregate to form soot. These carbon nanoparticles are known to be catalysts for the decomposition of hydrocarbon fuels into hydrogen and carbon, and could therefore be utilized in the process of extracting energy more efficiently from hydrocarbon fuels. Several studies have been performed on both Fulvenallene and carbon nanoparticles. For Fulvenallene, we have done extensive kinetics studies, and found that the rate of reaction between hydroxyl radicals and Fulvenallene is decreasing with temperature, within the range of 300K to 400K. This is significant, as it suggests an alternative mechanism for the reaction, compared with the abstraction pathway suggested in the current literature. For the carbon nanoparticles, we have completed extensive preliminary examinations of the system, and have begun to investigate the interaction of the hydroxyl radicals with the carbon nanoparticles.
Nanoscience Category

Nanoscience Category Index:


Poster 2: Mechanistic investigations of a cobalt-pincer catalyst for styrene functionalization. Leandra Forte & Brian Popp.

Poster 3: Surface photovoltage spectroscopy of solar energy materials. Conner Castle, Brandon Yost, Scott Cushing & Nianqiang Wu.


Poster 8: Computational study of the energies of pH low-insertion peptide (pHLIP) unfolding in vivo. Michael Bates, Austin Clark & Blake Mertz.

Poster 9: Band gap narrowing and increased charge carrier lifetimes in nitrogen-doped La$_2$Ti$_2$O$_7$ for photocatalytic solar water splitting and hydrogen generation. Brandon Yost, Scott Cushing, Nianqiang Wu & Alan Bristow.


Poster 12: Incorporation of ferric hydroxide-supported gold nanoparticle catalyst to reductively cyclize aromatic nitro compounds. Aaron Kessler, Katy Lambson & Björn Söderberg.


Poster 14: Assessment of titanium dioxide nanoparticles in aquatic exposure tanks. Sara Melow & Lisa Holland.
**Nanoscience Category**

**Poster 15:** *Impact of nanomaterial exposure on the reactivity of small arteries in the mesentery.*  
**Rebekah Krupa, Phoebe Stapleton, Alaeddin Abukabda, Valarie Minarchick & Timothy Nurkiewicz.

**Poster 16:** *Developing a novel method for isolating dormant breast cancer cells.*  
**Victoria Haberman, Chris Adkins & Paul Lockman.

**Poster 17:** *Optimization of silver nanoparticles yield for metallic inks.*  
**Anna Cokeley, Maria Torres Arango, Jared Beard & Konstantinos Sierros.

**Poster 18:** *Biomimetic alveolar model for nanotoxicological study.*  
**Ryan Mezan, Kai Wang, Xiaoqing He, Yon Rojanasakul, Liying Wang & Yong Yang.

**Poster 19:** *Bionano-enzyme conjugates with bacterial decontamination capabilities.*  
**Andrew Maloney, Alan Campbell & Cerasela Zoica Dinu.

**Poster 20:** *Coherent spectroscopy of strain-split exitons in bulk gallium arsenide.*  
**Joey Ashley, Alan Bristow & Brian Wilmer.

**Poster 21:** *Hydrogel encapsulation to preserve enzyme functionality.*  
**Jordan Chapman & Cerasela Zoica Dinu.

**Poster 22:** *Fabrication of micro-nano-hybrid topography using subcritical carbon dioxide.*  
**Oliver Lin, Kai Wang & Yong Yang.

**Poster 23:** *Targeted detection of volatile chemicals using DNA aptamers.*  
**Everett Daly, Michel Aldrige, Letha Sooter, Kevin Daly & David Lederman.

**Poster 24:** *Exposure to carbon nanotubes affects cellular protein expressions.*  
**Cassidy Seamon, Reem Eldwud & Cerasela Zoica Dinu.

**Poster 25:** *Direct-writing of polymer precursors to form high-temperature ceramic sensors and circuits.*  
**Alec Salakovich, Ozcan Ozmen, Rajalekshmi Pillai, Katarzyna Sabolsky, Konstantinos Sierros & Edward Sabolsky.

**Poster 26:** *Relative toxicity initiated by occupational particle exposure to RAW 264.7 cells.*  
**Emily Fabyanic, Anna Morris, Katherine Dunnick, Melissa Badding & Stephen Leonard.
Nanoscience Category

**Nanoscience Poster 1:**

**Enzyme-based conjugates for use in antibacterial coating of titanium alloy implants**

Melanie Hott and Cerasela Zoica Dinu

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

Titanium is a commonly used material for surgical implants due to its biocompatibility. However, after implantation, bacteria growth on its surface can lead to implant rejection and patient-associated complications. Development of a biocompatible, antibacterial coating could reduce biofouling and improve implant viability. Our research focuses on preparing enzyme-based conjugates to be used for antibacterial coatings. To understand and evaluate the effectiveness of such coatings, we used the model enzyme Soybean Peroxidase (SBP) and nanosupports. The nanosupports were selected to have different geometries (determined by scanning electron microscopy) that could ensure maximum loading of the enzyme. Conjugates were prepared by physical and covalent binding. The amount of SBP and the activity of the conjugates were quantified via colorimetric assays, and conjugate activity was reported to the specific activity of free SBP. Stability and activity were tested over seven days to observe the effectiveness and efficiency of the conjugates. This study provides the stepping-stone for the development of a functional platform with high biocompatibility and reduced biofouling.

**Nanoscience Poster 2:**

**Mechanistic investigations of a cobalt-pincer catalyst for styrene functionalization**

Leandra Forte and Brian Popp

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

Styrene and its derivatives serve as the basis for many important compounds, especially those used in pharmaceuticals, so simplification and increased efficiency in their use is beneficial. Because of this, the development of catalyst systems synthesized from inexpensive, nontoxic, and easily obtainable transition metals, for example base metals, and capable of effective styrene functionalization is in progress. A catalyst consisting of cobalt(II) complexed with a bis-phosphinite-pyridine (PONOP) pincer ligand was developed and found to functionalize vinyl arenes effectively via a transfer hydrometallation reaction using a simple grignard reagent; however, the mechanism by which this occurs is still not well understood. We used a ReactIR™ 15, an instrument capable of monitoring the IR absorbance frequencies of all species in situ as the reaction occurs, to determine rate data for the catalytic functionalization of styrene. Rate dependence gives insight on the mechanism by which the reaction occurs and indicates its definite effectiveness. Through better understanding of the mechanism, the system can be improved and the range of substrates it is optimal for better understood and expanded.
Nanoscience Category

**Nanoscience Poster 3:**

**Surface photovoltage spectroscopy of solar energy materials**

Conner Castle, Brandon Yost, Scott Cushing, and Nianqiang Wu

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

Manipulating semiconductors to increase overall solar efficiency can be done by adding materials, such as dopants or plasmonic nanoparticles, or by changing its structure. However, adding to or changing the material will also add in unwanted defect states in the band gap of the semiconductor, which are difficult to detect and harm solar efficiency. When light shines on a semiconductor there is a charge separation within the material when electrons (negative charge) are separated from their respective holes (positive charge), this is seen as a potential across the semiconductor. By making a capacitor between the semiconductor and a transparent electrode this potential, which correlates to where the charge separation occurs (whether its from mid-gap states, defect states, or band gap transitions), can be measured by a technique known as surface photovoltage spectroscopy (SPV). SPV setup was implemented to measure charge type and the effect of heterostructuring on charge transport in CdS@Au@TiO2 nanostructures to improve the solar energy conversion efficiency.

**Nanoscience Poster 4:**

**The impact of a buffer layer on magnetic dead layers in lanthanum strontium manganite**

Austin Jantzi, Robbyn Trappen, and Mikel Holcomb

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

As devices become both smaller and more powerful, there is a greater need to understand interface effects. Interface effects occur where two different materials meet, and these effects lead to properties that are very different than those of the bulk material. Magnetic dead layers are a type of interface effect when a magnetic material losses its magnetism at an interface. The root causes of magnetic dead layers are not well understood as many material properties change at the interface. Discovering these causes could enable researches to restore or even enhance magnetism at interfaces, which would lead to useful applications, such as more efficient electronic components and memory. This study investigates the effect of a buffer layer on the magnetism of La$_{0.7}$Sr$_{0.3}$MnO$_3$ (LSMO) thin films at interfaces. The thin films were grown using pulsed laser deposition, and time was spent optimizing the growth of the buffer material, strontium ruthenate (SRO). The magnetic properties of LSMO thin films and LSMO thin films grown on SRO buffer layers were compared using a superconducting quantum interference device.
Nanoscience Category

**Nanoscience Poster 5:**

**Assessing cellular damage caused by multi-walled carbon nanotubes using micronuclei**

Constance Mitchell, Katelyn J. Siegrist, David Lowery, Steven H. Reynolds and Linda M. Sargent

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

As a material with commercial applications, Multi-Walled Carbon Nanotubes (MWCNT) production has increased in recent years. However, due to their size and geometry, it has been found that these particles cause damage to the lungs. This poses a threat to workers involved in the production. This study analyzed primary and immortalized lung epithelial cells exposed to seven treatments of native and coated nanotubes. After treatment, the cells were stained with a probe that stains the centromere, allowing for the analysis of chromosomal damage and/or alterations in chromosome number. Damage was assessed by counting micronuclei, which is a nucleus that forms whenever a chromosome is not transferred into a daughter nuclei during mitosis. This common genotoxicity analysis can be used in vivo to quantify chromosomal damage. It was determined that a MWCNT with a diameter of 50 nm had the most micronuclei per cells (15.98%) while those treated with nanotubes that have a branched geometry had the least (4.04%). Based on the quantification of micronuclei, it can be concluded that MWCNT caused genotoxicity in treated cells.

**Nanoscience Poster 6:**

**Fabrication of a gold nanoparticle-functionalized paper microfluidic device for the detection of biomarkers from whole blood**

Anna Gutridge¹ and Veronica Betancur³, Xuefei Gao², Nick Wu², Yuxin Liu³

¹*Department of Biochemistry, Wittenberg University, Springfield, OH 45501*, ²*Lane Department of Computer Science and Electrical Engineering*, ³*Department of Mechanical Engineering and Aerospace Engineering, West Virginia University, Morgantown, WV 26505*

Diagnostic testing is widely unavailable in the developing world due to a lack of healthcare, medical instruments and health professionals. As a result, there are great needs for diagnostic tools with low fabrication costs, ease of interpretation, and compatibility with low sample volumes. An integrated paper based device with flow directed by hydrophobic wax channels and propelled by capillary action has been developed allowing for plasma separation from whole blood through a plasma separation membrane, detection of a targeted biomarker (IgG) down to 0.05 mg/mL, easy handling for the user and low fabrication costs. Using gold nanoparticles (AuNPs), which exhibit colorimetric properties, the detection of proteins in the blood can be made possible by linking the AuNPs to antibodies corresponding to the targeted biomarker using gold nanoparticle-based colorimetric sandwich immunoassay. In the design and fabrication of the integrated device, the amount of antibodies and AuNPs to functionalize the paper substrate were modified. With further modification, this platform can be used to test for a multitude of biomarkers in the body.
**Nanoscience Poster 7:**

**Quantifying atrazine by pH-mediated stacking in capillary electrophoresis**

Scott A. Lopez, Cassandra L. Crihfield, Lisa A. Holland

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26508*

Atrazine is an herbicide that has been banned in the European Union and is commonly used in the United States. It has been associated with cancerous abnormalities in the endocrine system of fish. Current methods of studying concentrations of atrazine in the environment involve multiple time consuming steps in a laboratory which is a barrier to routine or remote monitoring of atrazine. Therefore, a new detection strategy for atrazine was developed that is amenable to portable analyses. The method used in this research utilizes a pH-mediated stacking technique and capillary electrophoresis equipped with ultraviolet-visible absorbance detection to achieve nanomolar limits of quantification. The analytical figures of merit were established and support detection of atrazine in environmental samples at levels regulated by the EPA. The samples are first separated and detected within a 6 minute time span. The method was applied to river water. These results serve as the basis for portable detection.

**Nanoscience Poster 8:**

**Computational study of the energetics of pH low-insertion peptide (pHLIP) unfolding in vivo**

Michael B. Bates, Austin R. Clark and Blake Mertz

*C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506-6045*

The pH low-insertion peptide (pHLIP) has the ability to insert and fold across the cell membrane, with potential applications in treating diseases characterized by acidic tissue such as cancer. pHLIP can exist in three different states: unstructured in an aqueous environment, bound to the surface of a bilayer, and inserted across a bilayer as an alpha helix. When in the alpha-helical state, pHLIP can potentially deliver cargo molecules to diseased tissue through a covalent linkage to the C-terminus of the peptide. When pHLIP is bound to the surface of a cell membrane, low pH drives pHLIP to insert across the membrane and form the α-helical structure. Using molecular dynamics (MD) simulations, the protonated and deprotonated forms of PHLIP were reversibly unfolded in solution from the α-helical state. Potential of mean force calculations were carried out to determine the free energy of formation of pHLIP’s α-helical structure to better understand pHLIP’s insertion across a membrane.
Nanoscience Category

**Nanoscience Poster 9:**

**Band gap narrowing and increased charge carrier lifetimes in nitrogen-doped \( \text{La}_2\text{Ti}_2\text{O}_7 \) for photocatalytic solar water splitting and hydrogen generation**

Brandon Yost\(^1\), Scott K. Cushing\(^{1,2}\), Nianqiang Wu\(^2\), Alan D. Bristow\(^1\)

\(^1\) Department of Physics and Astronomy and \(^2\) Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV 26506-6106, USA

With fossil fuels running low, new methods of renewable energy are needed. By creating a semiconductor with a band gap around 2 eV, it can be used to split water into hydrogen and oxygen to use as fuel. Nitrogen doping was found to extend lanthanum dititanate’s (LTO), \( \text{La}_2\text{Ti}_2\text{O}_7 \), absorption from 380 nm to 550 nm giving a promising 2.3 eV bandgap for solar water splitting and allowing for visible light photoactivity. In this presentation, transient absorption spectroscopy with a supercontinuum and THz probe confirm N-doping creates a continuum of states above pristine LTO’s valence band (VB) without harming carrier lifetimes. Lifetimes are measured for carriers excited from the VB to the CB as well as from the dopant continuum to the CB. These measured lifetimes reveal lifetimes comparable to intrinsic LTO. The THz probe confirms the visible light excited carriers are mobile and not trapped, allowing a large increase in photoactivity. Further, by adding reduced graphene oxide (RGO) and gold nanoparticles to the N-doped LTO, these important values are increased, tripling hydrogen generation.

**Nanoscience Poster 10:**

**Photonic crystal blue LEDs and development of an Arduino-based testbed for CubeSat**

Jequil S. R. Hartz, Matthew J. Pachol, Anand Kadiyala, and Jeremy M. Dawson

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

Group III-nitride-based light-emitting diodes (LEDs) are known for their wide band gaps and various applications. Specifically, gallium nitride (GaN) based LEDs have been found to be highly resistant to radiation and allow for novel space applications. However, LEDs face intrinsic issues, including poor light extraction. The light extraction efficiency of the device can be further improved using a combination of photonic crystals (PhC) and transparent conducting layers (TCLs) like indium tin oxide (ITO). PhCs were previously found to extract the trapped portion of the light while TCLs allow improvements in both optical and electrical characteristics of LEDs. This work is focused on modeling, fabrication, and characterization of PhC structures in ITO for maximum improvement in light extraction. A detailed comparison of electrical and optical characteristics between fabricated planar and PhC LEDs was also conducted. A NASA CubeSat will be used for testing the performance and durability of GaN-based LEDs in an uncontrolled space environment. Arduino, an open-source prototyping platform, was utilized for the emulation of a testbed for performing basic LED lifetime experiments in space.
World energy demands are continuously growing but the primary sources, fossil fuels, have proven negative environmental impacts associated with their utilization. A solution to this issue is the production of hydrogen as a result of photocatalytic water splitting. A potential material for this process is Lanthanum Titanium Oxide (LTO) due to its chemical stability and electronic band structure sufficient to drive necessary water splitting reactions. However, bulk LTO has low electrical conductivity, leading to charge carrier recombination in the material prior to photoelectrochemical reactions at the surface. In this work, LTO’s photoelectrochemical performance will be optimized by using a nanoscale coating of LTO on a conductive Zinc Oxide nanowire array to reduce charge carrier recombination occurring in bulk LTO. The Zinc Oxide arrays will be synthesized by hydrothermal methods and coated with LTO via Sol-Gel techniques. The thickness of the LTO coating will be optimized for greatest photoelectrochemical performance. The resultant arrays show better photoelectrochemical activity than the bulk LTO.

Incorporation of ferric hydroxide-supported gold nanoparticle catalyst to reductively cyclize aromatic nitro compounds

Aaron M. Kessler, Katy E. Lambson and Björn C. G. Söderberg

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

Indoles provide the backbone for multiple biologically relevant compounds pertinent to the pharmaceutical and healthcare industries. The synthesis of these compounds often requires the incorporation of a catalyst to reductively cyclize the penultimate aromatic nitro compound into the final indole product. Many previously developed catalysts are not capable of selectively reducing the nitro portion of the compound or are too inefficient or unsafe for practical laboratory use. In contrast, a ferric hydroxide-supported gold nanoparticle catalyst is nontoxic, cost-effective, and has been shown to selectively reduce aromatic nitro compounds. Research has focused on integrating the gold nanoparticle catalyst in place of previously used catalysts, such as palladium complexes, in reactions designed to produce basic indole derivatives via reductive cyclization of corresponding aromatic nitro compounds. Thus far, no indole derivative has been successfully synthesized. Multiple substrates have been tested, but only starting material has been recovered. Adjustments, such as altering the reaction temperature and time, will be made to the production of the catalyst to examine these variables’ effects on the catalyst’s efficiency.
Nanoscience Category

**Nanoscience Poster 13:**

Microscale quantification of nanoparticle-biomolecule interactions with capillary electrophoresis

Julia A. Mouch, Tyler A. Davis, Marriah Ellington, and Lisa Holland

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The uses of nanotechnology are becoming more prevalent in everyday commercial products; however any potential health risks or harmful side effects of nanoparticles must be understood. Nanoparticle toxicity has been demonstrated in animals and cells, but fundamental studies are required to elucidate specific interactions between nanoparticles and physiologically relevant biomolecules. Conventional affinity methods require excessive quantities of homogeneous nanoparticles. These barriers are overcome with rapid microscale affinity analyses of nanoparticle-biomolecule interactions. Methods based on capillary electrophoresis separate nanoliter sample volumes of nanoparticles in minutes based on velocity in an electric field. Under equilibrium conditions affinity binding is determined by directly assessing bound and free concentrations of biomolecules. Under nonequilibrium conditions the nanoparticle-equilibrium mixtures can be analyzed in a single capillary electrophoresis separation. This research outlines the suitability of capillary electrophoresis for different nanoparticles.

**Nanoscience Poster 14:**

Assessment of titanium dioxide nanoparticles in aquatic exposure tanks

Sara L. Melow and Lisa A. Holland

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Titanium dioxide nanoparticles are widely used in makeup, sunscreens, and paint with an estimated 38,000 tons produced annually. Many of these nanoparticles enter waterways such as rivers and lakes. There is evidence that titanium dioxide nanoparticles in the environment impact the health of humans and wildlife. Animal exposure experiments are used to demonstrate the exacerbation of chemical toxicity through nanoparticles. For aquatic exposure, the distribution of these nanoparticles in water over the time course of the experiment must be established before animal studies can be conducted effectively. Nanoparticles were dosed in a flow-through exposure tank over a 24-hour period and the concentration of titanium in the exposure tank was determined using inductively coupled plasma-atomic emission spectroscopy. An acid digestion of the titanium dioxide nanoparticles was validated, allowing the nanoparticles to solubilize and later analyzed by the inductively coupled plasma. With this study accomplished, exposure experiments can be performed, so the effects of titanium dioxide nanoparticles in waterways can be determined further.
Nanoscience Category

Nanoscience Poster 15:
Impact of nanomaterial exposure on the reactivity of small arteries in the mesentery

Rebekah C. Krupa, Phoebe A. Stapleton, Alaeddin B. Abukabda, Valerie C. Minarchick, and Timothy R. Nurkiewicz,

Department of Physiology and Pharmacology, West Virginia University, Morgantown, WV 26506

Engineered nanomaterials (ENM) have specialized unique physicochemical properties due to their small size of (<100 nm). Nano-titanium dioxide (nano-TiO$_2$) is an ENM that has broad applications from coatings on medical implants to cosmetics. The increase in the domestic and industrial applications of ENM signifies a greater risk for exposure with potential adverse health consequences. Previous in vitro studies have shown that pulmonary exposure to ENM causes impairment in microvascular reactivity. In this study, the effect of pulmonary exposure to nano-TiO$_2$ on plasma levels of inflammatory mediators was observed. Second and third order mesenteric arterioles were obtained from Sprague-Dawley rats. Microvascular endothelium-dependent and –independent reactivity was assessed in response to acetylcholine ($10^{-9}$-$10^{-4}$ M) and sodium nitroprusside ($10^{-9}$-$10^{-4}$ M), respectively. Vascular smooth muscle was assessed with phenylephrine ($10^{-9}$-$10^{-4}$ M), an alpha-adrenergic agonist. After acquiring initial measurements of mean arterial pressure [91±3.5 mm Hg] and heart rate [324±3 beats per minute], the maximum vascular endothelium-dependent dilation [83±20%], endothelium-independent dilation [87±73%] and smooth muscle constriction [-408±249%] were obtained. This research evaluates the biological outcomes of ENM exposure to maintain consumer safety.

Nanoscience Poster 16:
Developing a novel method for isolating dormant breast cancer cells

Victoria A. Haberman, Chris Adkins and Paul Lockman

Department of Basic Pharmaceutical Sciences, School of Pharmacy, West Virginia University, Morgantown, WV 26506

When cancer cells migrate from primary tumor sites to other tissue sites, two cellular behaviors may follow, a dormant phenotype or an actively proliferating phenotype. In order to discern what causes some cells to remain dormant while others actively proliferate, we devised a method to isolate dormant cancer cells from brain metastases of breast cancer. Human MDA-MB-231Br and JIMT-1 breast cancer cells were labeled with BNF-Dextran-RF nanoparticles and were evaluated in vitro. Various labeling reagents were tested to determine the optimum method for magnetic nanoparticle labeling. Protamine sulfate had the highest efficiency for MDA-MB-231Br labeling and QTracker had the highest efficiency for JIMT-1 labeling. Successfully labeled cells were injected intracardially into female NuNu mice to metastasize to the brain. Cells that metastasize to brain will either remain dormant or proliferate, which significantly reduces intracellular nanoparticle concentrations. FLOW cytometry will be used to separate dormant cells from proliferating cells through magnetic nanoparticles. This method will propel future research provides researchers a novel ability to directly study metastatic dormant cancer cells as opposed to actively proliferating cancer cells.
Nanoscience Category

Nanoscience Poster 17:

Optimization of silver nanoparticle yield for metallic inks

Anna M. Cokeley, Maria A. Torres Arango, Jared J. Beard, Konstantinos A. Sierros

West Virginia University, Department of Mechanical & Aerospace Engineering, Morgantown, WV, 26505

Metallic inks play a vital role in today’s electronics. As devices become more compact, the electronic components of those devices have to become smaller as well. These inks are important because they can be printed for nanodevices in a cost effective manner to produce conducting films, patterns, or features of various sizes. The metallic ink in this work was comprised of silver nanoparticles. The silver ink synthesis involved three key factors in the precursor solution: a silver salt and reducing and capping agents. The silver salt provided the silver for the reaction; the reducing agent allowed particles to nucleate; and the capping agent limited particle growth to the nanoscale. In this work, we investigated the reduction agent in the precursor solution for the ink. We evaluated monoethanolamine and diethanolamine in the particle synthesis. We observed that less reducing agent is required when using monoethanolamine which is related to its pH being ~5% more basic than diethanolamine. We showed that the initial particle size and yield was affected by using different reducing agents in appropriate amounts.

Nanoscience Poster 18:

Biomimetic Alveolar Model for Nanotoxicological Study

Ryan Mezan¹, Kai Wang¹, and, Xiaoqing He², Yon Rojanasakul², Liying Wang³, and Yong Yang¹

¹Department of Chemical Engineering and ²Department of Department of Pharmaceutical Sciences, West Virginia University, ³National Institute of Occupational Health and Safety, West Virginia University

Development in engineered nanomaterials has created new potential in revolutionizing healthcare, energy, electronics and various other areas. With the rise of these new technologies, occupational and consumer exposure will undoubtedly increase. Assessing the unintended consequences on human health of these nanomaterials requires extensive toxicological studies. Current techniques typically involve animal testing, which can be very expensive, facility limited, and heavily regulated. Newer in vitro models have been employed to overcome the pitfalls of animal testing but fall short replicating the native lung environment. Here, a novel method in reproducing the alveolar microenvironment was explored. Human lung fibroblasts were cultured on various nanopatterns and exposed to a representative nanotoxin, carbon nanotubes. These nanopatterns illustrated a profound impact in collagen-I production. Nanotopologies were then integrated into a microfluidic model that recapitulates vital physical characteristics of the lung micro-environment such as fluidic forces, and cyclic mechanical strain. This biomimetic platform provides a precise tool to map vital cell responses to nanomaterials in a cheap, efficient, and sustainable manner.
Nanoscience Category

Nanoscience Poster 19:

**Bionano-enzyme conjugates with bacterial decontamination capabilities**

Andrew J. Maloney, Alan S. Campbell, Cerasela Zoica Dinu

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Outbreak of severe infections due to inefficient or unsuccessful decontamination of surfaces could impact civilians and infrastructures leading to unfavorable socio-economic impacts. The next generation of decontamination technologies needs to reduce the logistical burdens associated with infection prevention preferably through use of green technologies. In this work, we seek to create environmentally friendly, self-sufficient, self-cleaning, enzymatic bionano conjugates to be integrated in fabrics and paints and be used for biological decontamination. These conjugates should reduce operational burdens associated with harsh chemical agents commonly used to prevent infectious outbreaks. Our technology utilizes two enzymes, namely glucose oxidase (GOx) and chloroperoxidase (CPO), attached to a nanosupport to generate a potent decontaminant, hypochlorus acid (HOCl). The mechanisms of HOCl generation as well as the conditions that impact enzymatic immobilization, activity, and kinetic parameters at the nanosupport have been investigated to determine the optimum circumstances for maximum decontamination capability. With these conjugates, we have demonstrated killing of over 99% for *E. Coli* at $10^6$ CFU/mL in the first thirty minutes of treatment.

Nanoscience Poster 20:

**Coherent spectroscopy of strain-split excitons in bulk gallium arsenide**

Joey Ashley$^1$, Alan D. Bristow$^2$, Brian Wilmer$^2$

$^1$Radford University Department of Physics and Department of Math, Radford, VA 24141
$^2$West Virginia University Department of Physics and Astronomy, Morgantown, WV 26506

Two dimensional Fourier transform spectroscopy is used to observe exciton states in strained bulk Gallium Arsenide (GaAs). Degeneracy breaking of the heavy hole and light hole energy states is caused by strain on the sample, and allows for the observation of coherent coupling features between the two exciton states. Bulk GaAs differs from quantum wells in its inhomogeneity, and is a model system for isolating and elucidating many-body interactions without quantum confinement. Rephasing, non-rephasing, zero quantum, and two quantum scans have been performed on the sample. A phase retrieval program using a four wave mixing signal from individual scans has been developed for more accurate data processing. Preparations have also been made for further research on semiconductor microcavities using a reflection geometry, which is necessary for samples which cannot be studied in a transmission geometry.
Nanoscience Category

Nanoscience Poster 21:

Hydrogel Encapsulation to Preserve Enzyme Functionality

Jordan Chapman and Cerasela Zoica Dinu,

Department of Chemical Engineering, West Virginia University, Morgantown, WV

Enzymes are highly specific biocatalysts that have applications in fields as diverse as drug delivery and alternative fuel production. However, for such applications to be viable the enzymes need to preserve their activity and functionality on a variety of temperature and pH changes. Herein, we are studying the effects of enzyme encapsulation on preserving enzyme functionality at interfaces to help reduce the inhibitory effects of temperature and pH and thus increase its shelf-life and reusability. Using soybean peroxidase (SBP) as a model enzyme, we ensured its encapsulation in hydrogel beads composed of alginate gel and calcium crosslinks. To minimize enzyme leaching and temporal loss of activity, we used scaffolds of nanomaterials of carbon known to provide nanointerfaces with stabilizing effects. The activity and stability of the immobilized and encapsulated SBP was optimized relative to the activity of the free SBP in a variety of environments (e.g., different temperature and solvents). By studying and understanding the benefits that enzyme encapsulation can offer this research could be extended to applications in pharmaceuticals, fragrances, or specialty chemicals, where defining the environment that allows for minimum operational changes is imperative necessary.

Nanoscience Poster 22:

Fabrication of micro-nano-hybrid topography using subcritical carbon dioxide

Oliver Lin, Kai Wang and Yong Yang

Department of Chemical Engineering, West Virginia University, Morgantown, WV 26506

For the study of cell-matrix interactions in vitro, complex hybrid patterns of micro and nanopatterns are desirable surface topography as it accurately represents the hierarchical structure of extracellular matrix in vivo. However, fabrication of a multilayered pattern has proved challenging as it requires a processing temperature below the bulk glass transition temperature (T_g) of the polymeric substrate to prevent substrate deformation. Attempts to imprint at this low temperature and pressure has often resulted in incomplete pattern transfer. A method to alleviate the issue is use of multilayered substrates with decreasing T_g to control the pattern transfer depth, but it is costly. In our study, a novel approach applying subcritical CO_2 to polystyrene surface is employed to reduce surface T_g to a controllable depth and allow accurate nanoimprinting without bulk deformation. Both the imprinting temperature and pressure were observed to be critical factors for successful control of the transferred pattern depth. With this low-cost novel technique, we have demonstrated the ability to produce physiologically relevant substrates with micro-nano-hybrid topographies for studying cell-matrix interactions.
**Nanoscience Category**

**Nanoscience Poster 23:**

**Targeted detection of volatile chemicals using DNA aptamers**

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The eNose project aims to create an olfactory biosensor capable of detecting specific volatile chemicals. This is done through attaching DNA aptamers to a Field Effect Transistor (FET). When in the presence of a target odor, the aptamers bond to the odorant molecules, thus communicating the odor's presence to the user by changing the measurable electrical properties of the FET. Previous successful designs for similar sensors used arbitrary DNA strands, creating sensors which responded to arbitrary stimuli. Currently, aptamers undergo selective pressure such that DNA sequences which bond in desirable fashion are returned. This is to allow for the manufacture of sensors for particular odorants on demand. Thus far, an ATP specific sensor has been completed to generate preliminary data. Other sensors are in progress, and could detect anything which gives off a volatile chemical signature, like metabolic disease, spoiled food, various explosives, hazardous waste, and injured bodies.

**Nanoscience Poster 24:**

**Exposure to carbon nanotubes affects cellular protein expressions**

Cassidy Seamon, Reem Eldwud, and Cerasela Zoica Dinu

*Chemical Engineering Department, West Virginia University*

Carbon nanotubes (CNTs) have applications ranging from electronic devices and desalination systems, to imaging and drug delivery. However, with CNTs implementation in such fields there are corresponding concerns associated with toxicity, such as how their inhalation in working environments affects cellular systems. Understanding the complex interaction between CNTs and model cellular systems used to resemble the first line of defense by inhalation in exposed biological systems will help us evaluate the risk of usage. For this, we exposed BEAS-2B human lung epithelial cells to single walled carbon nanotubes (SWCNTs) for 24 h. Subsequently, we lysed the exposed cells and used western blots analysis to quantify SWCNTs-induced effects on known proteins responsible for cell adhesion, cell-cell interaction and cell cycle. Furthermore, using optical microscopy, we evaluated the effects of SWCNTs on the cellular membrane as well as determined SWCNTs localization. Our results show that risk assessment aimed to reduce inhalation exposure needs to be considered before further implementation of SWCNTs.
Nanoscience Category

**Nanoscience Poster 25:**

Direct-writing of polymer precursors to form high-temperature ceramic sensors and circuits

Alec B. Salakovich\(^1\), Ozcan Ozmen\(^2\), Rajalekshmi Pillai\(^2\), Katarzyna Sabolsky\(^2\), Konstantinos A. Sierros\(^2\), Edward M. Sabolsky\(^2\)

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Polymer-derived ceramics (PDC) is a term applied to the family of materials synthesized by the high temperature firing of polymers containing a silicon backbone. PDC are notable materials due to their semi-conductivity and high oxidation resistance at temperatures exceeding 1000 °C. In addition, PDC precursors may be easily modified in order to use direct-write technologies to form complex sensor or electrical circuit patterns. In this work, thermistor and pressure sensors were produced by robocasting a PDC dispersion composed of titanium diboride in polymethylhydrosiloxane. The resultant ceramic/polymer dispersion was printed onto alumina substrates. These patterns were then heated to >400 °C to form a ceramic composite containing nano-SiOC and TiB\(_2\). The thermoelectric and electromechanical properties of the materials were measured as a function of temperature using a digital multimeter and a dynamic mechanical analyzer (DMA). The work demonstrated a method to form high-temperature, all-ceramic sensors, which could be applied within harsh-environment applications such as turbine engines, chemical reactors, and combustors.

**Nanoscience Poster 26:**

Relative toxicity initiated by occupational particle exposure to RAW 264.7 cells

Emily B. Fabyanic\(^1,2\), Anna M. Morris\(^1\), Katherine M. Dunnick\(^1,3\), Melissa A. Badding\(^1\), Stephen S. Leonard\(^1,3\)

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Pulmonary occupational exposures to potentially dangerous materials is a risk that many workers encounter. This study’s purpose was to determine relative toxicity of four particles that are found in occupational environments including: gas metal arc welding with stainless-steel and mild-steel electrodes, sintered-indium tin oxide (SITO), and cerium oxide nanoparticles. These particles have a wide range of applications and are known to generate varying forms of toxicity, causing anything from pulmonary injury to neurodegeneration. Particles were characterized and a model was used to determine pulmonary toxicity by measuring: cell viability, free radical production, membrane damage, DNA damage, and cytokine production. Results show that both of the welding fume exposures result in a relatively higher production of reactive oxygen species. SITO causes the production and release of cytokines, indicating an increased cellular response to this compound at a lower dose. Cerium oxide nanoparticles significantly decreased viability and caused the most membrane damage. Results demonstrate that occupational particles can cause various types of cellular toxicity/damage, thereby activating downstream pathways, which can give rise to adverse physiological effects.
Social Sciences Category

Specialty Sciences Category Index:


**Poster 2:** The influence of disgust sensitivity on sociopolitical values. **Shelby Boggs**, Cameron Ford & Natalie Shook.

**Poster 3:** Analysis of dosage via combination interaction in iCook 4-H program. **Matthew Parsley**, Jade White & Melissa Olfert.

**Poster 4:** School meal programs and the feed to achieve act in West Virginia. **Colin Lopez**, Bradley Wilson & Joshua Lohnes.

**Poster 5:** Examining the effect of varied stimulus designs in phonological processing. **Taylor Haggerty** & Michelle Moore.


**Poster 7:** Treatment of chronic low back pain with respiratory muscle training. **Heidi Meyer**, Randall Bryner, Mark Olfert & Scott Davis.
Social Sciences Category

Social Sciences Poster 1:

Pretty theft: a sociological view of shoplifting

Brittany M. Brown, James J. Nolan, and Amanda K. Sanchez

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While theft has continued to be one of the most commonly committed non-violent crimes, the Morgantown Area Youth Services Project (MAYSP) and the Granville Police Department have partnered in creating an intervention program for first-time offenders charged with petty theft. The five week program has been an optional alternative to criminal prosecutions for those who have been caught shoplifting in the town of Granville, West Virginia since 2012. During an evaluation of the program’s ability to prevent reoffending, a sociological perspective was applied to help explain a routine set of deviant acts. After analyzing trends in gender, age, occupation, education, and income, the focus group of the study became females ages eighteen to twenty-three. The data revealed 78.7 percent of the randomly selected participants were female. Almost half of these female participants were stealing beauty enhancement products including make-up, clothing, and jewelry. The sociological perspectives in this study are used to analyze the gendered nature of petty theft.

Social Sciences Poster 2:

The influence of disgust sensitivity on sociopolitical values

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Humans have adapted many strategies to help avoid disease and fight of pathogens. One emotion in particular, disgust, has evolved to aid in pathogen avoidance and limits the transmission of diseases. Previous research has found that disgust is part of the “behavioral immune system” which also contributes to the avoidance of other people or situations that are potentially harmful or toxic to the individual. As a result, some humans are more sensitive to experiencing disgust than others, particularly people who tend to be more conservative. In this study we induced disgust into participants by having them write about eating a bowl of maggots and measured their sociopolitical values and prejudicial attitudes via an online survey. Results of this study indicated that there was a significant relationship between disgust sensitivity and conservatism, as mediated by beliefs in a dangerous world. We hypothesize that there is also a relationship between disgust sensitivity, conservatism, and prejudicial attitudes.
Social Sciences Category

Social Sciences Poster 3:

**Analysis of dosage via combination interaction in iCook 4-H program**

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The iCook 4-H research program is a multi-state, childhood obesity prevention project. A unique approach for the afterschool program is the utilization of dyads, pairs consisting of an 8-10 year old child and their primary caregiver. The pairs participate and learn together at the eight sessions, each of which lasts for two hours. The curriculum focuses on healthy choices in regards to eating and physical activity, increasing cooking skills, and encouraging family meal time. Families were recruited via flyers, in-person talks, and newspaper articles; however, certain barriers, such as time commitments, prevented a lot of possible recruits. An analysis of the recruit’s program exposure, or dosage, was compared across all five states. Dosage is primarily influenced by attendance to all of the iCook sessions and attendance to the five booster sessions that were held over the 24 month period. Dosage tracking will aid in determining program engagement or disengagement, allowing amendments to the curriculum. It is expected that greater involvement should correlate with an increase in overall health of the dyads.

Social Sciences Poster 4:

**School meal programs and the feed to achieve act in West Virginia**

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Ensuring food security and nutrition for the nation’s youth has been a matter of the upmost importance since President Truman started the National School Lunch Program in 1946. West Virginia addressed these issues by implementing the Community Eligibility Provision (CEP) in 2012 and passing the Feed To Achieve Act in 2013. Both of these laws function to increase access to breakfast and lunch to students in the state. In this study, meal participation data was collected for every school in West Virginia. We also conducted interviews with staff of the Office of Child Nutrition to better understand the implementation and timeline of these projects. Findings from this study suggest that these programs have resulted in a steady increase in school meal participation in West Virginia since being implemented; however, we also found a higher meal participation percentage in CEP schools versus non-CEP schools. Our findings suggest that increasing school participation in CEP could improve child access to nutrition and food security.
**Social Sciences Category**

**Social Sciences Poster 5:**

**Examining the effect of varied stimulus designs in phonological processing**

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Recent work in communication sciences and disorders has used an experimental manipulation of age of consonant acquisition to explore long-term memory representations of speech sounds retrieved during various language tasks. However, there are potential confounding factors in the stimulus design of this experimental approach. This study examines age of consonant acquisition using a regression-based approach in order to strengthen the claims of previous findings and to further explore the contribution of long-term phonological knowledge in language. Participants aged 18-26 years complete three experimental tasks, nonword repetition, nonword reading, and lexical decision, using stimuli that vary in the use of early and late developing speech sounds. Preliminary findings support the prediction that participants perform better on items in which the average age of consonant acquisition is lower. The results of this work will contribute to the body of work exploring the role of long-term phonological knowledge in spoken language. Future work could use a similar approach to explore how the use of long-term phonological knowledge may vary in people with language impairments.

**Social Sciences Poster 6:**

**Effects of short-term compassion training on physiological responses to interpersonal stress**

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Callously ruminating about the difficult people in one’s life creates physiological symptoms of stress that, over time, threaten mental and physical health. To simulate this process of rumination, participants listened to narratives describing personally familiar disliked individuals. Heart rate increased when listening to “disliked person” vs. unfamiliar narratives (mean increase=1.71bpm, p<.01, n=34). In a subset (n=9), we measured electrodermal activity, an indicator of the “fight-or-flight” response, and found a trend of increased conductance when listening to disliked vs. unfamiliar narratives (mean increase=3.12μS, p=.10). We further tested the effectiveness of compassion meditation, an ancient practice that aims to mitigate extreme affective responses toward others. As such, participants were instructed to practice compassion vs. control training via smartphone app for one month. Previous data suggest that participants trained in compassion showed attenuated stress responses to disliked narratives in the post-training session, compared to pre-test (pre-training increase=3.03bpm, p<.05, n=9; post-training increase=3.76bpm, p=.16, n=9). Although we have not collected enough control data to differentiate from habituation effects, preliminary results support an easily accessible, cost-effective intervention for reducing interpersonal stress.
Chronic low back pain (LBP) is currently one of the most prevalent disabilities, and is defined as pain in the lumbar region of the spine that has been present for longer than 3 months. This study tests the hypothesis that respiratory muscle training (RMT) used to strengthen the diaphragm will improve core muscle strength, help to stabilize the spine, and reduce low back pain. Assessment of self-perceived pain (i.e. LBP questionnaire), pulmonary function, and abdominal/respiratory muscle strength will be performed on participants with chronic LBP prior to, after 4-weeks and after 8-weeks of RMT. Training entails hyperventilating for 20 minutes/day, 3 days/week, for a total of 8 weeks on a resistive breathing device termed the SpiroTiger®. We hypothesize that self-reported pain will be improved in concert with evidence of increases in diaphragm strength and function. The study is currently on-going (n=3 subjects in training) with a goal of enrolling up to 20 subjects. Upon study completion, statistical analysis will be used to compare effectiveness of RMT on the measured parameters.