2013

2013 Symposium Brochure

STEM SURE/IRES, NANOSAFE REU, WVU HONORS SURE, BIOLOGY REU, SURI

Summer Undergraduate Research Symposium

Thursday, July 25, 2013
Erickson Alumni Center
West Virginia University
Morgantown, WV

nanosafe.wvu.edu - biology.wvu.edu/nsf-reu
www.honors.wvu.edu/sure or /STEMSURE - www.hsc.wvu.edu/wvucn

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

Summer Undergraduate Research Symposium 2013
West Virginia University

Thursday July 25, 2013
Erickson Alumni Center, Ruby Grand Hall
West Virginia University
Morgantown, WV

I. Schedule of Events

9:00-9:30 AM	Poster Setup ─*Undergraduate participants arrive, register, and put up posters. Participants must leave Erickson Alumni Center by 9:30 AM and should return at 11:00 AM.*
9:30-11:00 AM	Poster judging ─ *No participants present and not open to public.*
11:00-11:45 AM	Welcome and Key Note Speaker ─ *All welcome: parents, research advisors, graduate students, undergraduate participants, and general public.* • *Welcome: Dr. Michelle Richards-Babb, Associate Prof., Chemistry* • *Introductory Remarks: Dr. Keith Garbutt, Dean of the Honors College* • *Key Note Speaker: Dr. Michele G. Wheatly, Provost, WVU*
11:45 AM-12:30 PM	Lunch ─ *Judges and poster presenters first priority.*
12:30 PM-2:30 PM	Poster Presentations ─ *Open to all and concurrent with final judging of posters. Poster judging will continue with judges assessing participant's ability to answer questions related to his/her 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 & STEM SURE participants)*

II. Poster Judges

Judge	Affiliation	Category Judging
Heimo Riedel	Biochemistry, WVU School of Medicine	*Biological & Health Sciences*
Kim Quedado	NanoSAFE, WVU	*Biological & Health Sciences*
Dan Panaccione	Plant and Soil Sciences, WVU Davis College	*Biological & Health Sciences*
Eugenia Pena-Yewtukhiw	Plant and Soil Sciences, WVU Davis College	*Agricultural & Environmental Sci.*
Jamie Schuler	Forestry & Natural Resources, WVU Davis College	*Agricultural & Environmental Sci.*
Rakesh Gupta	Chemical Engineering, WVU Statler College	*Physical Sciences & Engineering*
Glenn Jackson	Forensics & Investigative Science, WVU Eberly College	*Physical Sciences & Engineering*
Marcela Redigolo	WVU Shared Research Facilities	*Nanosciences*
R. Lloyd Carroll	Mylan Pharmaceuticals	*Nanosciences*

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!

WestVirginiaUniversity.

III. Undergraduate Participants and Faculty Research Mentors

A. Nano Research Experiences for Undergraduates (REU) Site: Multifunctional Nanomaterials (PI: Michelle Richards-Babb; co-PI: David Lederman)

Participant	Poster	Major	Home School	Faculty Advisor
Shannon Aippersbach	Nanosci #12	Bioengineering	Penn State U.	Tim Nurkiewicz, Physiology & Pharmacol.
Timothy Brown	Nanosci #16	Engineering Physics	U. of Tulsa	David Lederman, Physics
Justin Dicks	Nanosci #6	Chemistry	Elmira College	Lisa Holland, Chemistry
Gary Eurice	Nanosci #15	Chemical Eng.	U. of Maryland-Baltimore County	Jeremy Dawson, Elec. Eng.
Vanessa Furby	Nanosci #14	Biology Educ.	Shepherd U.	Peter Gannett, Pharmacy
Bonnie Newman	Nanosci #4	Chemistry & Appl. Math.	Geneva College	Terry Gullion, Chemistry
Julia Oliveto	Nanosci #2	Chemistry	Fairmont State U.	Fabien Goulay, Chemistry
Patrick Teixeira	Nanosci #8	Physics	Salisbury U.	Mikel Holcomb, Physics
Kevin Vargas Velez	Nanosci #17	Physics: Theoretical	U. of Puerto Rico, Mayaguez	Alan Bristow, Physics
Frank Youmbi	Nanosci #3	Chemistry	St. Francis U.	Brian Popp, Chemistry
Holly Whitelam	Bio & Health Sci #24	Bioengineering	U. of Pittsburgh	Jeremy Dawson, Elec. Eng.

B. Biology Research Experiences for Undergraduates (REU) Site: Biological Responses to the Environment from Genes to the Ecosystem (PI: Richard Thomas)

Participant	Poster	Major	Home School	Faculty Advisor
Jared Baird	Ag & Env Sci #1	Cell & Molec. Biology	Washington & Jefferson College	Jennifer Hawkins, Biology
Michael Cruciger	Bio & Health Sci #16	Molec., Cell, & Develop. Biology	Yale University	Rita Rio & Andrew Dacks, Biology
Maria Cuevas	Ag & Env Sci #12	Environ. Sci. & Spanish	Sweet Briar College	Nicolas Zegre, Forestry & Natural Resources
Chibuzor Ejimofor	Ag & Env Sci #3	Biochemistry	West Virginia U.	Jonathan Cumming, Biology
Ashley Geraets	Ag & Env Sci #11	Biochemistry	Washington & Jefferson College	Vagner Benedito, Plant & Soil Sciences
Eric King	Ag & Env Sci #15	Environmental Sustainability	Eastern Mennonite U.	Jingjing Liang, Forestry & Natural Resources
Zachery Lonergan	Bio & Health Sci #5	Biology	West Virginia Wesleyan C.	Jennifer Gallagher, Biology
Katrina Schlum	Ag & Env Sci #10	Bioinformatics	St. Bonaventure U.	Daniel Panaccione, Plant & Soil Sciences
Sandra Simon	Ag & Env Sci #13	Biology	West Virginia U.	Stephen DiFazio, Biology
Daniel Walton	Ag & Env Sci #9	Forest Res. Management	West Virginia U.	Richards Thomas, Biology
Ross Whitehead	Ag & Env Sci #8	Biology	Rutgers U.	William Peterjohn, Biology

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

Participant	Poster	Major	Home School	Faculty Advisor
Derek Andreini	Bio & Health Sci #28	Biochemistry	West Virginia U.	Linda Vona Davis, Surgery
Loretta Aromeh	Bio & Health Sci #4	Biochemistry	West Virginia U.	Josheph McFadden, Biochemistry
Andrew Biundo	Nanosci #13	Biology	West Virginia U.	Peter Gannett, Pharmacy
Trevor Butcher	Phys Sci & Eng #7	Chemistry	West Virginia U.	Brian Popp, Chemistry
Wei-Ting Chang	Phys Sci & Eng #18	Electrical Eng.	West Virginia U.	Matthew Valenti, CS & EE
Guy Cordonier	Nanosci #18	Mechanical Eng.	West Virginia U.	Kostas Sierros, AE & ME
Vincent Dartigue	Bio & Health Sci #29	Biochemistry	West Virginia U.	Kim Barnes, Biochemistry
Dara Erazo	Ag & Env Sci #19	Geography & International Studies	West Virginia U.	Brenden McNeil, Geography & Geology
Amanda Harker	Ag & Env Sci #5	Environmental & Natural Res. Economics	West Virginia U.	James Burnett, Agriculture and Resource Economics
Nancy Isner	Nanosci #1	Math & Chemistry	West Liberty U.	James Lewis, Physics
Megan Jewell	Nanosci #7	Chemical Eng.	West Virginia U.	Letha Sooter, Pharmacy
Quinn Jones	Phys Sci & Eng #17	Computer Sci. & Engineering	West Virginia U.	Gianfranco Doretto, CS & EE
Andrew Liounis	Phys Sci & Eng #8	AE & ME	West Virginia U.	John Christian, AE & ME
Michael Lokant	Bio & Health Sci #20	Biochemistry	West Virginia U.	Rajesh Naz, Obstetrics & Gynecology
Samuel Miller	Phys Sci & Eng #19	Math & Chemistry	West Liberty U.	Stephen Valentine, Chemistry
Cheyenne Parsley	Nanosci #11	Computer Science	West Virginia U.	Timothy Menzies, CS & EE
Michael Powell	Phys Sci & Eng #21	AE & ME	West Virginia U.	John Kuhlman, ME & AE
Hannah Ritchie	Bio & Health Sci #21	Psychology	West Virginia U.	Hawley Montgomery-Downs, Psychology
Kirsten Schoonover	Bio & Health Sci #25	Psychology	West Virginia U.	Miranda Reed, Psychology
Rachel White	Ag & Env Sci #14	Chemistry	West Virginia Wesleyan C.	Lisa Holland, Chemistry

D. STEM SURE Participants Supported by Faculty Research Advisors (Justin Legleiter and Brenden McNeil)

Participant	Poster	Major	Home School	Faculty Advisor
Sarah Esker	Nanosci #19	Secondary Sci. Educ.	West Virginia U.	Justin Legleiter, Chemistry
Ty Heimerl	Ag & Env Sci #2	Geography	West Virginia U.	Brenden McNeil, Geography

E. International Research Experience for Students at Jilin University in China (PI: Michael Shi - CAREER Award funding for travel and partial funding through STEM SURE)

Participant	Poster	Major	Home School	Faculty Advisor
Emma Dolan	Nanosci #10	Chemistry	West Virginia U.	Michael Shi, Chemistry
Natalie Geise	Nanosci #5	Chemistry	West Virginia U.	Michael Shi, Chemistry
Tesia Gregg	Nanosci #9	Biochemistry	West Virginia U.	Michael Shi, Chemistry
Andrew Maloney	Ag & Env Sci #18	Chem. Eng.	West Virginia U.	Michael Shi, Chemistry
Nathan Mickinac	Phys Sci & Eng #13	Chem. Eng.	West Virginia U.	Michael Shi, Chemistry
Shaylyn Walter	Bio & Health Sci #23	Chemistry	West Virginia U.	Michael Shi, Chemistry

F. WVU Honors administered Summer Undergraduate Research Experiences (SURE) Site (PI: Keith Garbutt; SURE Director: Ahnya Redman)

Participant	Poster	Major	Home School	Faculty Advisor
Walter Baker	Phys Sci & Eng #3	Physics & Math	West Virginia U.	Edward Flagg, Physics
Christopher Bell	Ag & Env Sci #16	Biochemistry	West Virginia U.	Vagner Benedito, Plant $ Soil Science
Matthew Brooks	Ag & Env Sci #20	Biochemistry	West Virginia U.	Janet Tou, Human Nut. & Foods
Morgan Bush	Ag & Env Sci #17	Biochemistry	West Virginia U.	Kim Barnes, Biochemistry
Conor Corcoran	Bio & Health Sci #15	Biochemistry	West Virginia U.	Blake Mertz, Chemistry
Jordan Drew	Phys Sci & Eng #20	Biometric Systems	West Virginia U.	Jeremy Dawson, CS & EE
Robert Gardner	Ag & Env Sci #4	Chemistry	West Virginia U.	Amy Keesee, Physics
Christopher Gates	Phys Sci & Eng #11	Chem. Eng.	West Virginia U.	John Zondlo, Chem. Eng.
Drew Goodman	Phys Sci & Eng #5	Mechanical Eng.	West Virginia U.	Hailin Li, Mech. & Aerospace Eng.
E. Hannah Hoblitzell	Ag & Env Sci #7	Animal & Nutritional Sci.	West Virginia U.	Kim Barnes, Biochemistry
Pranav Jain	Bio & Health Sci #3	Biochemistry	West Virginia U.	Justin Legleiter, Chemistry
Dylan LaMariana	Bio & Health Sci #14	Psychology	West Virginia U.	Aaron Metzger, Psychology
April Liska	Phys Sci & Eng #16	Physics & Math	West Virginia U.	Duncan Lorimer, Physics
Tessa Maynard	Phys Sci & Eng #6	Physics & Computer Sci.	West Virginia U.	Amy Keesee, Physics
Evan McIntyre	Phys Sci & Eng #4	Industrial Eng.	West Virginia U.	Ed Sabolsky, Mech. & Aerospace Eng.
Natasha McMann	Phys Sci & Eng #12	Physics	West Virginia U.	Duncan Lorimer, Physics
Lukas Meadows	Bio & Health Sci #2	Biology	West Virginia U.	Andrew Dacks, Biology
Alexandria Mullins	Phys Sci & Eng #9	Chemistry	West Virginia U.	Jessica Hoover, Chemistry
Nainika Nanda	Ag & Env Sci #21	Chemistry	West Virginia U.	Janet Tou, Human Nut. & Foods
Brooks Paine	Bio & Health Sci #30	Biochemistry	West Virginia U.	Janet Tou, Human Nut. & Foods
Alan Rejonis	Bio & Health Sci #26	Biology	West Virginia U.	Miranda Reed, Psychology
Savannah Sims	Ag & Env Sci #6	Chem. Eng.	West Virginia U.	Cerasela Dinu, Chem. Eng.
Craig Tenney	Phys Sci & Eng #15	Physics	West Virginia U.	Duncan Lorimer, Physics

Participant	Poster	Major	Home School	Faculty Advisor
Amy Wells	Bio & Health Sci #18	Biochemistry	West Virginia U.	Melissa Olfert, Human Nut. & Foods
Nathan Whitehair	Phys Sci & Eng #14	Computer & Electrical Eng.	West Virginia U.	Yaser Fallah, Comp. Sci. & Elect. Eng.

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

Participant	Poster	Major	Home School	Faculty Advisor
Yarden Avnor	Bio & Health Sci #7	Integrated Neuroscience	Binghamton U.	George Spirou, Otolaryngology, Physiology & Pharmacology
Marissa Gogniat	Bio & Health Sci #12	Neurosci. & Behav. Biology/Psychology	Emory U.	Miranda Reed, Psychology
Joshua Gross	Bio & Health Sci #8	Psychology	James Madison U.	David Siderovski, Physiology & Pharmacology
Keegan Guffey	Bio & Health Sci #11	Biology & Psychology	West Virginia U.	Paola Pergami, Pediatrics
Dillon Huffman	Phys Sci & Eng #10	Applied Physics	West Virginia Wesleyan C.	Valeriya Gritsenko, Human Performance
Priyanka Jagannath	Bio & Health Sci #9	Chemistry	West Virginia U.	Visvanathan Ramamurthy, Ophthalmology
Kristen Johnson	Bio & Health Sci #1	Psychology	Oberlin College	Hawley Montgomery-Downs, Psychology
Thomas Lavin	Bio & Health Sci #22	Biology	U. of Maine	James Simpkins, Physiology & Pharmacology
Kyvonn Morton	Bio & Health Sci #13	Biology	U. of the Virgin Islands	James O'Donnell, Behav. Med. & Psychiatry
Kartik Motwani	Bio & Health Sci #19	Chemistry	West Virginia U.	George Spirou, Otolaryngology, Physiology & Pharmacology
Cody Mullens	Bio & Health Sci #10	Biology	West Virginia U.	George Spirou, Otolaryngology, Physiology & Pharmacology
Nikul Patel	Bio & Health Sci #6	Chem. Eng.	West Virginia U.	Sergiy Yakovenko, Human Performance
Jessica Patterson	Bio & Health Sci #10	Biology	West Virginia U.	George Spirou, Otolaryngology, Physiology & Pharmacology
Arpan Prabhu	Bio & Health Sci #17	Natural Sciences w/ Chemistry focus	U. of Pittsburgh	Julie Brefczynski-Lewis, Physiology & Pharmacology
Hayley Still	Bio & Health Sci #31	Psychology	Lewis & Clark C.	James Lewis, Neurobiology & Anatomy
Ogaga Urhie	Bio & Health Sci #27	Biology	West Virginia U.	Aric Agmon, Neurobiology & Anatomy

H. WVU National Research Experience for Undergraduates Program (WVU NREUP) (Director: Jessica Deshler)

Participant	Poster	Major	Home School	Faculty Advisor
Alyssa Diaz	Phys Sci & Eng #1 & #2	Psychology	West Virginia U.	Marjorie Darrah & Ryan Hansen, Mathematics
Donna Jackson	Phys Sci & Eng #1 & #2	Computer Sci. & Eng.	West Virginia U.	Marjorie Darrah & Ryan Hansen, Mathematics
Ephraim Pittore	Phys Sci & Eng #1 & #2	Mechanical Eng.	West Virginia U.	Marjorie Darrah & Ryan Hansen, Mathematics
Adam Strong	Phys Sci & Eng #1 & #2	Petroleum Eng.	West Virginia U.	Marjorie Darrah & Ryan Hansen, Mathematics

IV. Speakers at REU/SURE Events

Speaker	Affiliation	Group(s)	Topic
David Lederman	Dept. of Physics, WVU	Nano REU	Basis Aspects Nanosci./Eng.
Barbara Foster	Dept. of Chemistry, WVU	Nano REU & SURE	Laboratory Safety
Aniketa Shinde	Educ. & Outreach Coordinator	Nano REU & SURE	Nanoscale Characterization, Nanofabrication Methods &
Michelle Richards-Babb	Dept. of Chemistry, WVU	Nano REU Nano REU & SURE REU & SURE	Oral Present. Skills/Lab Notebks, Scientific Ethics, and Effective Poster Presentations
Linda Blake	Wise Library, WVU	Nano REU & SURE	Scientific Search Tools
Constinia Charbonnette	WVU Office of Graduate Education	REU & SURE	GRE Preparation & Graduate School Roundtable
Clint Springer	Assistant Prof., St. Joseph's U.	Biology REU & SURE	Career Mentoring & Work in Academia
Dan Stover	Department of Energy	REU & SURE	Career Mentoring & Government Work
Sandy Hartenstine Williams	President/Sr. Enivornm. Scientist, BlueSkies Environm. Associates, Inc.	REU & SURE	Career Mentoring & Work in Industry
Donna Davies	Valley Forge National Park Service, Project Manager	REU & SURE	Career Mentoring & Government Work
Julie Bryan	Children's Discovery Museum	SURE	STEM Outreach & Science Communication; Science Outreach at Morgantown's Kids Day
Melinda Hollander	Animal Compliance & Training Officer, Office of Research Integrity & Compl.	REU & SURE	Ethics of Animal Use & Care
Amy Cyphert & Cate Johnson	ASPIRE Office, WVU	SURE	Prestigious Scholarships
Toni Jones	Career Services, WVU	SURE	Cover letters, resumes, & Interviewing

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/International Experience: http://www.honors.wvu.edu/STEMSURE/home.html
Biology REU: http://biology.wvu.edu/nsf-reu
WVU Honors administered SURE: www.honors.wvu.edu/sure
WVU Center for Neuroscience SURI: http://www.hsc.wvu.edu/wvucn/Summer-Internships-(SURI)

VI. Acknowledgements

A. Personnel

Nano REU
Michelle Richards-Babb, PI
David Lederman, co-PI
Corey Nida, Asst. to REU Director

STEM SURE
Michelle Richards-Babb, Director/Educ. Coord.
Corey Nida, Asst. to SURE Director & Class TA
With help from the staff in the Honors Office and in the ECAS Business Office

Biology REU
Richard Thomas, PI

STEM SURE IRES/CAREER
Michael Shi, PI

WVU Honors administered SURE
Keith Garbutt, PI
Ahnya Redman, Director

WVU National Math REU
Jessica Deshler, PI & Director

SURI
George A Spirou, Director
Erica Stewart, Coordinator

Symposium Booklet
Michelle Richards-Babb
Corey Nida
Becky Secrist

Symposium Planning
Ahnya Redman
Keith Garbutt
Michelle Richards-Babb
Corey Nida

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. **Biology REU (PI: Richard Thomas)**
Sponsored by the NSF Division of Biological Infrastructure (DBI-1156627) and in part by the WVU Department of Biology and the WVU Eberly College of Arts and Sciences.

3. **STEM SURE (Director: Michelle Richards-Babb)**
Sponsored and funded by the WVU Office of the Provost with partial funding from the WVU Eberly College of Arts and Sciences, Statler College of Engineering and Mineral Resources, Davis College of Agriculture, Natural Resources, and Design and the Robert C. Byrd Health Science Center School of Pharmacy. Special thanks to Mridul Gautam and Nigel Clark for their help in securing this funding for the 2013 program.

4. **STEM SURE IRES/CAREER (PI: X. Michael Shi)**
Travel funding sponsored by a National Science Foundation CAREER grant awarded to Michael Shi (CHE-0844602). Student stipends funded by WVU Office of the Provost through the STEM SURE program.

5. **WVU Honors administered SURE (PI: Keith Garbutt)**
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 College of Engineering and Mineral Resources and The Honors College.

6. **WVU Center for Neuroscience SURI (Director: George A. Spirou, Program Coordinator: Erica Stewart)**
Funded by the Center for Neuroscience and the NIH/NIGMS CoBRE Grant 8P30GM103503.

7. **WVU National Research Experience for Undergraduates Program (WVU NREUP) (Director: Jessica Deshler)**
This program is a Mathematical Association of America (MAA) activity funded by NSA (grant H98230-13-1-0270) and NSF (grant DMS-1156582).

8. **Research Symposium Monetary Prizes**
Sponsored by the WVU Office of the Provost through the STEM SURE program.

Biological and Health Sciences Category

Bio & Health Sci Index

Poster 1: *Sleepless in the Sleep Lab.* **Kristen Johnson**, Amanda McBean & Hawley Montgomery-Downs.

Poster 2: *Characterization of serotonin receptor-expressing neurons in an olfactory region of the fruit fly brain.* **Lukas Meadows** & Andrew Dacks.

Poster 3: *Polydiacetylene assay suggests interaction between huntingtin 51Q and lipid bilayers with varying compositions.* **Pranav Jain**, Maxmore Chaibva & Justin Legleiter.

Poster 4: *Fatty Acid Catabolism Decreases Lipid Accumulation and Modifies Fatty Acid Profile in Adipocytes.* **Loretta Aromeh**, Angela Santin & Joseph McFadden.

Poster 5: *Genetic variation and copper resistance in Saccharomyces cerevisiae.* **Zachery Lonergan** & Jennifer Gallagher.

Poster 6: *Muscle Adaptation in Asymmetric Locomotion of Humans.* **Nikul Patel**, Erienne Olesh & Sergiy Yakovenko.

Poster 7: *Molecular basis for intrasomatic polarity during synapse formation in early brain development.* **Yarden Avnor**, Paul Holocomb, Tom Deerinck, Mark Ellisman & George Spirou.

Poster 8: *Regulator of G Protein Signaling-12 (RGS12) Dysfunction as a Potential Etiology of Schizophrenia.* **Joshua Gross**, Bryan Gall, Kim Wix, Vincent Setola, Molly Crowe, Emily Oestreich, Thomas Kash, Sheryl Moy, Steven Kinsey & David Siderovski.

Poster 9: *Nonsense suppressors: A cure for blindness?* **Priyanka Jagannath**, Brian Popp & Visvanathan Ramamurthy.

Poster 10: *Structural transformations in dendrites during early development.* **Jessica Patterson**, **Cody Mullens**, Paul Holcomb & George Spirou.

Poster 11: *Monitoring Gait Parameters and Balance in Young Children: Correlation between GAITRite and Microsoft Kinect.* **Keegan Guffey**, Patrick Hathaway, Gianfranco Doretto, Corrie Mancinelli, Teresa Rice & Paola Pergami.

Poster 12: *Diet-induced obesity as a risk factor in Alzheimer's disease.* **Marissa Gogniat**, Carolyn Rudy, Holly Hunsberger & Miranda Reed.

Poster 13: *Investigating Behavioral Effects of Deleting Phosphodiesterase-2 in the Dorsal vs. Ventral Hippocampus in Mice.* **Kyvonn Morton**, L.M. Lueptow, H.T. Zhang, S. Kolandaivelu, V. Rammamurthy & J.M. O'Donnell.

Poster 14: *Association between Political Ideology and Core Beliefs, In Adolescents'.* **Dylan LaMariana**, Benjamin Oosterhoff & Aaron Metzger.

Poster 15: *Uptake and release pathways of retinal in rhodopsin photocycle.* **Conor Corcoran** & John Mertz.

Biological and Health Sciences Category

Poster 16: *Unveiling the magic behind mucus: a metatranscriptomic and behavioral analysis.* **Michael Cruciger**, Brittany Ott, Andrew Dacks & Rita Rio.

Poster 17: *Compassion Meditation Increases Positive Perceptions of Difficult People.* **Arpan Prabhu**, Alex DelGiorno, Aina Puce & Julie Brefczynski-Lewis.

Poster 18: *Effects of sleep extension on perceived mood, stress, and quality of life in female college athletes.* **Amy Wells**, Oluremi Famodu & Melissa Olfert.

Poster 19: *Segregated Innervation & Nuclear Eccentricity in Calyx of Held Development.* **Kartik Motwani**, Paul Holcomb, Tom Deerinck, Mark Ellisman & George Spirou.

Poster 20: *Do men with prostate abnormalities (prostatitis/benign prostatic hyperplasia/prostate cancer) produce antibodies to PSA?* **Michael Lokant** & Rajesh Naz.

Poster 21: *Effect of sleep disturbance on awareness of sleepiness.* **Hannah Ritchie**, Amanda McBean & Hawley Montgomery-Downs.

Poster 22: *Effects of interferon-gamma on neuronal viability & mitochondrial function.* **Thomas Lavin**, Danielle Doll, Stephanie Rellick & James Simpkins.

Poster 23: *Micropatterning of polymer films and layer-by-layer self-assembly.* **Shaylyn Walter**, Ma Yingyi & Wu Lixin.

Poster 24: *Hand bacterial communities: a tool for health diagnostics, forensic analysis, and human identification.* **Holly Whitelam**, Amanda Holbert, Letha Sooter & Jeremy Dawson.

Poster 25: *Type II diabetes and leptin resistance: Implications for Alzheimer's disease.* **Kirsten Schoonover**, Carolyn Rudy, Holly Hunsberger & Miranda Reed.

Poster 26: *Comparison of NMDA receptor trafficking in Zucker rats.* **Alan Rejonis**, Holly Hunsberger, Carolyn Rudy & Miranda Reed.

Poster 27: *Novel Object Recognition: A Behavioral Assay for Assessing Whisker-Dependent Texture Discrimination in Mice.* **Ogaga Urhie**, John Cavendish & Ariel Agmon.

Poster 28: *Effects of diet and exercise on inflammatory markers in breast cancer survivors.* **Derek Andreini**, Anne Swisher & Linda Vona-Davis.

Poster 29: *Conjugated linoleic acid and weight loss in mice.* **Vincent Dartigue**, Kimberly Barnes & Quinnan Chen.

Poster 30: *Different sources of omega-3 fatty acids on lipogenic gene expression of cardiovascular disease risk factors.* **Brooks Paine**, Kaitlin Mock, Vagner Benedito & Janet Tou.

Poster 31: *Cortical representation of mimicable animal sounds.* **Hayley Still** & James Lewis.

Biological and Health Sciences Category

Bio & Health Sci Poster 1:

Sleepless in the Sleep Lab

Kristen Johnson, Amanda McBean and Hawley Montgomery-Downs

Department of Psychology, West Virginia University; Morgantown, West Virgnia

The postpartum period is characterized by interrupted sleep due to the demands of caring for an infant around the clock. The current study, still in the data collection phase, explores the unique effects of a postpartum sleep schedule on sleep architecture, daytime sleepiness, mood, and performance of healthy, childless, adult women. Gold standard measures of sleep and sleepiness including field-based actigraphy and laboratory-based polysomnography and multiple sleep latency tests are used. Mood is assessed using standard surveys. Ironically, sleep researchers often deprive themselves of a full night's sleep in order to study the sleep of others. Sleep deprivation has damaging effects including, but not limited to, disturbed circadian cycles, reduced alertness, performance deficits, and memory lapses. However, there are certain techniques that shift workers can employ in order to combat these detrimental effects. These include properly timed light exposure, shifting sleep schedules, caffeine consumption during the night shift, and optimizing the daytime sleep environment.

Bio & Health Sci Poster 2:

Characterization of serotonin receptor-expressing neurons in an olfactory region of the fruit fly brain

Lukas D. Meadows and Andrew M. Dacks

Department of Biology, West Virginia University, Morgantown, WV 26506-6045

Our nervous system must self-regulate its activity to respond properly in various physiological states, such as hunger, by releasing modulatory chemicals. This modulation is critical for healthy brain function, but little is known about how patterns of receptor expression govern the responses to these chemicals. The fruit fly is a model organism for this topic because of the numerical simplicity of its nervous system and the genetic tools available for experimentation. To explore this gap in knowledge, neurons that express the 5-HT_7 type receptor were studied in the antennal lobe, a brain region of olfactory processing. Based on the known excitatory effects of serotonin in this system and the known function of this receptor, we hypothesized that these neurons serve an excitatory function. Using genetic tools, immunocytochemistry, and confocal microscopy, we determined that these neurons do not release GABA, a common inhibitory chemical, and found the receptor expressed in one local interneuron and a subset of input neurons. This information will help illuminate the principles that direct function as well as dysfunction in sensory processing.

Biological and Health Sciences Category

Bio & Health Sci Poster 3:

Polydiacetylene assay suggests interaction between huntingtin 51Q and lipid bilayers with varying compositions

Pranav Jain, Maxmore Chaibva and Justin Legleiter

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

Huntingtin (htt) protein interaction and aggregation in nerve cells is characteristic of Huntington's disease. Prior research has shown that incorrect folding of this protein due to an expanded poly-glutamine (polyQ) chain near the N-terminus causes interaction with bilipid cell membranes and aggregation on their surfaces. The purpose of this research was to study interaction between the Huntingtin protein polymorph htt51Q and bilipid membranes of varying compositions. To accomplish this, a colorimetric bioassay known as Polydiacetlylene (PDA) assay was used. PDA is a polymer that reacts with lipids to form vesicles that mimic lipid bilayers. Our preliminary results showed that the interaction between PDA/lipid made with Total Brain Lipid Extract (porcine) and htt51Q correlated directly with htt51Q concentration. Furthermore, changing the composition of PDA/lipid by increasing the percentage of cholesterol, sphingomyelin, and GM1 lipids seemed to affect the degree of interaction between the lipid bilayers and htt51Q. These preliminary results suggest that htt51Q interacts and aggregates with lipid bilayers and varying lipid composition could potentially affect interaction/aggregation.

Bio & Health Sci Poster 4:

Fatty Acid Catabolism Decreases Lipid Accumulation and Modifies Fatty Acid Profile in Adipocytes

Loretta O. Aromeh, Angela E. Santin and Joseph W. McFadden

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

Obesity is a global health crisis caused by the accumulation of body fat. Innovative pharmacological approaches to prevent fat accumulation and associated complications are needed. Therefore, our objective was to evaluate the effects of a synthetic compound designed to inhibit fat synthesis and enhance fat breakdown on adipocyte biochemistry. Mouse adipocytes were cultured with hormones, and excess glucose and fatty acids (FA) for six days to stimulate adipogenesis. During the initial two days, cells were treated with 50 μM C75, a FA synthase inhibitor and carnitine palmitoyltransferase (CPT)-1 stimulator. Of three known CPT isoforms, polymerase chain reaction confirmed that CPT-1a is the primary isoform in our cultures ($P < 0.05$). Confirmed using the Calcein AM assay, C75 treatment did not alter cell viability. Using Oil red O staining, C75 treatment significantly decreased adipocyte lipid accumulation ($P < 0.05$). Furthermore, mass spectrometry revealed decreased saturated FA levels in C75 treated adipocytes ($P < 0.05$). Enhanced lipid accumulation can promote insulin resistance; therefore, future studies should be aimed at evaluating the effects of C75 on insulin action.

Biological and Health Sciences Category

Bio & Health Sci Poster 5:

Genetic variation and copper resistance in *Saccharomyces cerevisiae*

Zachery R. Lonergan[1] and Jennifer E.G. Gallagher[2]

[1]National Science Foundation Research Experience for Undergraduates Program and [2]Department of Biology, West Virginia University, Morgantown, WV 26506

Genetic variation within a species is essential for survival as environmental conditions shift. This variation has become significant with the use of copper as an antimicrobial agent. Although its use is widespread, how cells respond to copper exposure is not fully understood. We utilized growth differences of cells from a cross between copper sensitive and copper resistant *Saccharomyces cerevisiae* strains to conduct linkage analysis, which identified regions of the genome common in copper resistant strains. Within one of these regions *CUP1* was identified as a likely candidate for copper variation. The 5'-UTR varied between two strains of yeast, and each 5'-UTR allele was cloned upstream of *CUP1* and transformed into cells. When exposed to increasing concentrations of copper, growth patterns did not vary. Although we determined that copper resistance was a dominant trait in the strains analyzed, our results demonstrated that copper resistance is not solely reliant on the differences in *CUP1* 5'-UTR, but instead is a multi-locus trait. By identifying genes responsible for copper resistance, the antimicrobial properties of copper can be utilized more safely and efficiently.

Bio & Health Sci Poster 6:

Muscle Adaptation in Asymmetric Locomotion of Humans

Nikul Patel[1], Erienne Olesh[2] and Sergiy Yakovenko[1]

[1]Neural Engineering Laboratory, Center for Neuroscience, WVU and [2]Neuroengineering and Rehabilitation Laboratory, Center for Neuroscience, WVU

Muscle synergies are the units of motor control that were acquired to enable a wide repertoire of movements. The purpose of our project was to document muscle synergies and their modification during asymmetric gaits. In this study, we induced asymmetric locomotion (with obstacles) that was kinematically similar to that observed in neurological patients. The obstacles were placed on one leg to constrain the stride length of the other leg. Our dataset included 16 EMG signals and full-body kinematics that were analyzed offline to characterize the patterns of adaptation and deadaptation to obstacle. Using variation analysis, i.e. PCA & NNMF, we discovered that fewer synergies than expected were required to describe bilateral muscle activity. This supports the theory of spinal locomotor controllers in humans. We will use these results to develop focused rehabilitation of damaged neural pathways.

Biological and Health Sciences Category

Bio & Health Sci Poster 7:

Molecular basis for intrasomatic polarity during synapse formation in early brain development

Yarden Avnor, Paul Holocomb, Tom Deerinck, Mark Ellisman and George Spirou

Center for Neuroscience, West Virginia University School of Medicine

Polarity proteins play a vital role in cell differentiation, nuclear division, and structural polarity. However, their role in synaptogenesis and competition is poorly understood. We have identified a neural circuit of the auditory brainstem where intrasomatic polarity and synapse formation are temporally linked during postnatal days (P) 0-6 in mice. This circuitry, located at the caylx of Held (CH): medial nucleus of the trapezoid body (MNTB) terminal, has a well defined 1:1 end point of innervation and an easily identified large terminal. Preliminary data suggests a patterning of cell surface proteins that may create "growth zones" amenable to terminal development on the MNTB cell. Expression of multiple genes—previously identified using a microarray screen—that function in cell adhesion and signaling during P0-P6 are being mapped along the cell body surface by applying immunohistochemistry and confocal microscopy. These results will help identify molecular mechanisms for synapse formation during development in potentially all circuits that may be therapeutic avenues to treat disorders of neural wiring.

Bio & Health Sci Poster 8:

Regulator of G Protein Signaling-12 (RGS12) Dysfunction as a Potential Etiology of Schizophrenia

Joshua Gross[1], Bryan Gall[1], Kim Wix[1], Vincent Setola[1], Molly Crowe[2], Emily A. Oestreich[3], Thomas Kash[3], Sheryl S. Moy[3], Steven Kinsey[2] and David P. Siderovski[1]

[1]Department of Physiology and Pharmacology, West Virginia University, Morgantown, WV 26506, [2]Department of Psychology, West Virginia University, Morgantown, WV 26506, and [3]UNC-Chapel Hill School of Medicine, Chapel Hill, NC 27514

G protein-coupled receptors (GPCRs) are lucrative drug targets, being the largest single protein class of the druggable proteome. The Siderovski lab has discovered novel regulators of GPCR signaling ('RGS proteins') that accelerate GTP hydrolysis of $G\alpha_i$ subunits, which mediate some salutary effects of antipsychotics. One RGS protein, RGS12, has recently been implicated in schizophrenia (SCZ) by two independent exome-sequencing studies of non-affected parent-proband trios, each of which found a different *de novo* non-synonymous SNP. We show that RGS12 overexpression in HEK293T cells exhibits a similar decrease in dopamine D2-receptor signaling to typical antipsychotics. Using anti-RGS12 antibody and gene expression analyses, we demonstrate RGS12 expression in various SCZ-relevant regions of the rodent brain. Biochemical and electrophysiological studies suggest that RGS12 exerts an antipsychotic-like effect on excitatory glutamatergic cortico-striatal signaling. Behavioral studies of wildtype and RGS12-deficient mice point towards an anti-psychotic-like activity of RGS12: namely, *Rgs12*$^{-/-}$ mice display (1) impaired sensorimotor gating, (2) increased anxiety, and (3) increased stereotypy. These findings suggest that further studies of *RGS12* may illuminate the understanding and treatment of SCZ.

Biological and Health Sciences Category

Bio & Health Sci Poster 9:

Nonsense suppressors: A cure for blindness?

Priyanka Jagannath[1], Brian Popp[2] and Visvanathan Ramamurthy[1]

[1]Center for Neuroscience, [1]Departments of Ophthalmology and [2]Chemistry, West Virginia University, Morgantown, WV 26506

Leber Congential Amaurosis (LCA) is an inherited retinal disease characterized by severe vision loss in children. A common cause of LCA is a premature termination at amino acid position 278 (W278X) in the human *Aipl1* (*hAipl1*) gene. We propose a novel treatment that involves usage of translation read through drugs (TRIDs), in which a nonsense mutation is bypassed leading to translation of full-length protein. As a proof of principle, we demonstrate that aminoglycoside G418, a known TRID is able to suppress stop codon at 278 in h*Aipl1* gene. Unfortunately, G418 is toxic to cells and is not suitable for therapy. In contrast, PTC14, a non-toxic TRID currently in clinical trial for muscular dystrophy, did not restore full-length AIPL1. We then synthesized RTC13, another TRID successful in restoring dystrophin. At present efforts are underway to test RTC13 in its ability to restore full-length hAIPL1. Our long-term goal is to test the ability of a non-toxic TRID such as RTC13 in combination with gene therapy to restore vision an animal model for LCA.

Bio & Health Sci Poster 10:

Structural transformations in dendrites during early development

Jessica L. Patterson[1], Cody L. Mullens[1], Paul S. Holcomb[1] and George A. Spirou[1,2]

[1]Center for Neuroscience and [2]Department of Otolaryngology, West Virginia University, Morgantown, WV 26506

The dynamic development of dendrites plays a critical role in the formation of neural circuits by influencing the amount and type of innervation a neuron can receive. We analyzed dendrite growth patterns in a new model system we have established whereby auditory brainstem cells are innervated by a single large nerve terminal. We tested our qualitative hypothesis that dendrites grow, retract during nerve terminal growth, and then regrow to establish a final branching pattern. Serial block-face scanning electron microscopy (SBEM) was used to reconstruct three-dimensional tissue ultrastructure with nanoscale resolution. Two established methods for quantification of dendrite architecture, Sholl analysis and Strahler order, were used to analyze the development of dendrites and their branching characteristics in the SBEM volumes across ages postnatal day 2 through 9. Both techniques revealed abundant branching at P2 with a steady decline in length, number of dendrites, and branching through P9. Although a reduction in dendrite complexity typically occurs during dendrite maturation, elimination of entire dendrites has potentially been overlooked and may represent a novel aspect of neural circuit formation.

Biological and Health Sciences Category

Bio & Health Sci Poster 11:

Monitoring Gait Parameters and Balance in Young Children: Correlation between GAITRite and Microsoft Kinect

Keegan Guffey[1], Patrick Hathaway[2], Gianfranco Doretto[2], Corrie Mancinelli[3], Teresa Rice[3] and Paola Pergami[1]

Dept. of Pediatrics, Child Neurology[1], Dept. of Computer Science and Electrical Engineering[2] Dept. of Physical Therapy and Exercise Physiology[3], WVU, Morgantown, WV 26506

During the implementation of a rehabilitation regimen it is crucial to use validated measurements in order to evaluate treatment effectiveness. This is normally achieved by repeated evaluation by trained personnel that are only sporadically available in rural West Virginia. Evaluation of gait in children is additionally complicated by changes occurring with motor development. A standardized and economic measure of gait would provide important feedback to clinicians regarding the effect of rehabilitation interventions and guide accurate treatment modifications. The purposes of this study are: i) To identify gait parameters that particularly correlate with motor abilities in young children as assessed by a standardized measure of balance (modified BERG, adapted for children). ii) To determine the correlation between spatio-temporal parameters of gait recorded by the GAITRite (a carpetway with a grid of sensors) and the articulated body-tracker provided by Microsoft Kinect. Differences in parameters derived from the two systems will be revealed by applying statistical analysis to a collection of measurements. Correlations between variables measured by each system will be determined by Pearson and distance correlation to assess both linear and non-linear dependencies. We are presenting preliminary data on 73 subjects between the ages of 2 and 4 years. Preliminary results demonstrate that a combined acquisition using GAITRite and the Kinect body tracker is feasible, even in very young children, whereas only some sub-scores of the modified BERG can be obtained in subjects younger than 4. The initial partial analysis indicates that several test statistics can be extracted from the time series describing the 3D motion of the joints, some of which attempt to mimic the GAITRite measurements.

Bio & Health Sci Poster 12:

Diet-induced obesity as a risk factor in Alzheimer's disease

Marissa A. Gogniat, Carolyn C. Rudy, Holly C. Hunsberger and Miranda N. Reed

Behavioral Neuroscience Program, Department of Psychology, West Virginia University, Morgantown, WV 26506

Diet-induced obesity increases tau phosphorylation (ptau), an early pathological signature of Alzheimer's disease, and causes memory deficits. Our preliminary data suggests that ptau increases extrasynaptic NMDAR (E-NMDAR) expression and decreases synaptic NMDAR (S-NMDAR) expression. This imbalance is significant because S-NMDARs facilitate learning and memory, whereas E-NMDARs have detrimental effects on learning and memory. Recent work suggests that overexpression of vascular endothelial growth factor (VEGF) in adipose tissue protects against diet-induced obesity. We hypothesize that mice fed a high-fat diet with inactive VEGF in adipose tissue (adipoVEGF-/-) will exhibit exacerbated diet-induced ptau and E-NMDAR expression compared to controls (adipoVEGF+/+) fed a high-fat diet. We used subcellular fractionation and Western blotting to compare the expression of E-NMDARs to S-NMDARs in the hippocampus of adipoVEGF-/- and adipoVEGF+/+ mice fed a high-fat diet. If our predictions are correct, alterations in NMDAR trafficking could provide a mechanistic link among diet-induced obesity, ptau, and cognitive deficits.

Biological and Health Sciences Category

Bio & Health Sci Poster 13:

Investigating Behavioral Effects of Deleting Phosphodiesterase-2 in the Dorsal vs. Ventral Hippocampus in Mice

Kyvonn A. Morton, L.M. Lueptow, H.T. Zhang, S. Kolandaivelu, V. Rammamurthy and J.M. O'Donnell

Center for Neuroscience SURI Program West Virginia University, Morgantown, WV

Cyclic nucleotide phosphodiesterase (PDE's) are a family of enzymes responsible for the breakdown of intracellular second messengers cAMP/cGMP and have been implicated in a variety of behaviors including memory and psychiatric disorders. PDE-2 is highly expressed in the hippocampus, which is strongly involved in these behaviors; therefore, PDE-2 is thought to play a role in anxiety as well as learning and memory. This study will analyze the behavioral effects of a PDE-2 knockout using the Cre/Lox system. We hypothesize that selective deletion of PDE-2 in the ventral hippocampus will decrease anxiety-like behavior and depressive-like behavior, while deleting PDE-2 in the dorsal hippocampus will result in increased memory recognition. Following the selective deletion, all mice will undergo the elevated plus maze and hole board test to measure anxiety, the forced swim test and tail suspension to measure depression and object recognition to measure memory. Results are pending.

Bio & Health Sci Poster 14:

Association between Political Ideology and Core Beliefs, In Adolescents'

Dylan LaMariana, Benjamin Oosterhoff and Aaron Metzger

Department of Psychology, West Virginia University, Morgantown, WV 26506-6040

Previous research has examined associations between individual's core values and beliefs and their political identity, but little research has examined these associations during adolescence. Understanding how developing belief systems can be associated with differing political ideologies in adolescents may lead to a better understanding of the developmental antecedents of political ideology. The current study examined associations between core personal beliefs and political identification. The study also examined the association between political identification and engagement in political discussion. Results indicated that spirituality and social dominance orientation were strongly associated with adolescents identifying with a "conservative" political identity. Adolescent's engagement in political discussion was not associated with political identification nor did it moderate associations between core values and political identification. This study demonstrates ways in which emerging belief systems and nascent political ideology are associated during the teenage years. Findings point to the importance of considering in which adolescents define their political beliefs through comparison to their maintenance of core ideologies and beliefs.

Biological and Health Sciences Category

Bio & Health Sci Poster 15:

Uptake and release pathways of retinal in rhodopsin photocycle

Conor J. Corcoran and John B. Mertz

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

Rhodopsin is the mammalian dim light photoreceptor, an integral membrane protein. Activation of rhodopsin occurs when the covalently bound chromophore, retinal, absorbs a photon and undergoes an 11-*cis* to all-*trans* isomerization. Two pores (A and B) exist on the outer surface of the retinal binding pocket, each potentially serving as transport entrances. Our hypothesis is that intermolecular forces between opsin and retinaldehyde drive interactions between the ligand and membrane protein. We tested this hypothesis using the software AutoDock Vina and AutoDock4 to identify key ligand-receptor interactions. Our results suggest that retinal undergoes unidirectional uptake through Pore A and release through Pore B. The most favorable binding affinities were found when 11-*cis* retinal straddled Pore A and all-*trans* retinal straddled Pore B. In addition, mutation of Lys296 to the less bulky Gly296 produced more favorable binding affinities, eliminating the potential for retinal entering and leaving through the same pore. These findings are significant in developing our understanding the role of opsin in the retinoid cycle, a poorly understood process that has direct medicinal applications.

Bio & Health Sci Poster 16:

Unveiling the magic behind mucus: a metatranscriptomic and behavioral analysis

Michael Cruciger, Brittany Ott, Andrew Dacks and Rita V.M. Rio

Department of Biology, West Virginia University, Morgantown, WV 26505

The consequences of beneficial microbial infection regarding behavior have tremendous impact for human health but are poorly understood. Compared to the thousands of microbial species found in the human gut, the European medicinal leech, *Hirudo verbana*, presents a simple model with only two predominant gut symbionts. Although some leeches obtain symbionts through vertical transmission, they may also be acquired via mucus secreted by conspecifics. Here, we assess whether host symbiont-state can affect behavior. We compared wild-type and aposymbiotic (symbiont-free) leeches in behavioral assays to determine if host symbiont-state altered baseline behavior or their attraction to mucus. We concluded that aposymbiotic leeches exhibit riskier behavior and that leeches are significantly attracted to mucus, although this did not differ between the two groups. Furthermore, metatranscriptomic analyses were performed to discern mRNA signaling potentially involved in symbiont recognition within mucus. Mucosal attraction may have evolutionary benefits for facilitating the acquisition of a more diverse pool of symbionts. These results will serve as a foundation for future experiments to further investigate the evolutionary progression of host-microbe relationships.

Biological and Health Sciences Category

Bio & Health Sci Poster 17:

Compassion Meditation Increases Positive Perceptions of Difficult People

Arpan V. Prabhu[1], Alex DelGiorno[1], Aina Puce[2] and Julie Brefczynski-Lewis[1]

[1]Center for Advanced Imaging, Departments of Physiology & Pharmacology, West Virginia University School of Medicine, Morgantown, WV, USA; [2]Psychological & Brain Sciences, Indiana University, Bloomington, IN, USA

Numerous studies have shown that interpersonal stress consistently ranks among the top sources of stress in personal and work life for Americans. Encountering personally disliked people can cause great aversion and stress, though little research on the neural consequences exists. There is also a gap in understanding how best to cope with this relatively common stressor. In this study, 13 participants (age 45.4 years, range 26-63 years, 11 females) completed compassion meditation or relaxation training (control) exercises for 7 days. Brain activation was observed via fMRI and EEG for familiar disliked faces in comparison to viewing familiar liked faces and unfamiliar faces. Results showed increased right amygdala activation (*emotion-related* region) for disliked vs. liked faces and decreased activation after compassion meditation. Visual face-related regions such as bilateral fusiform (*cognitive-related* region) showed activation suppression below baseline for disliked faces. This suggests that compassion meditation may alleviate stress toward disliked others by reducing emotion-related and face-related neural responses.

Bio & Health Sci Poster 18:

Effects of sleep extension on perceived mood, stress, and quality of life in female college athletes

Amy Wells, Oluremi Famodu and Melissa Olfert

Davis College of Agriculture, Natural Resources, and Design, Department of Human Nutrition and Foods, West Virginia University, Morgantown, WV 26506

The purpose of this study is to determine the effect that sleep extension has on perceived quality of life as well as stress levels in female college athletes. Eleven female track and field athletes participated in the study and each completed a baseline sleep analysis as well as a sleep extension analysis, each spanning over a one week period. Changes in mood, stress levels, and Quality of Life (QoL) were measured by using Profile of Mood States (POMS), Cohen Perceived Stress Test (PSS), and a Quality of Life (QoL) survey including the number of unhealthy days in the past thirty days. Results indicate that there is no significance between a short period of sleep extension and improvement in POMS scores ($z = 1.58$, $p = 0.11$), PSS scores ($z = 1.60$, $p = 0.11$), or QoL unhealthy days ($z = 1.81$, $p = 0.07$). In conclusion, sleep extension over a short period of time does not improve any aspects in overall perceived quality of life.

Biological and Health Sciences Category

Bio & Health Sci Poster 19:

Segregated Innervation & Nuclear Eccentricity in Calyx of Held Development

Kartik Motwani[1], Paul Holcomb[1], Tom Deerinck[2], Mark Ellisman[2] and George Spirou[1]

Center for Neuroscience[1], West Virginia University School of Medicine and NCMIR[2], UCSD

Intracellular nuclear positioning is essential for proper neuronal differentiation and migration during development, and functionally important in laminar tissues such as cochlear hair cells and cone photoreceptors. However, little is known about the role of nuclear position in post-migratory development of non-laminar systems. Cells of one such system, the medial nucleus of the trapezoid body (MNTB), qualitatively demonstrate nuclear eccentricity in mice. These cells are innervated at maturity by the largest nerve terminal in the mammalian brain—the calyx of Held—which appears in IHC to respect cell polarity by growing preferentially on the cell surface opposite the nucleus. To assay cell polarity in synaptogenesis, we applied serial block-face scanning electron microscopy and 3D reconstructions of key time points in calyx development (postnatal days 0-9). Nuclear and terminal location on MNTB neurons was quantified using CAD techniques. Nuclei were eccentric ($p<0.05$, $n=45$) and cell growth and terminal development were directed away from the nuclear pole. These data may reveal novel synaptogenic mechanisms with general applicability across developing neural systems and relevant to developmental disorders.

Bio & Health Sci Poster 20:

Do men with prostate abnormalities (prostatitis/benign prostatic hyperplasia/prostate cancer) produce antibodies to PSA?

Michael T. Lokant and Rajesh K. Naz

Reproductive Immunology and Molecular Biology Laboratory, Department of Obstetrics and Gynecology, West Virginia University, Morgantown, WV 26506

Prostate-specific antigen (PSA) is produced by prostate gland. Its function is to liquefy semen after ejaculation. Besides semen, PSA can also be detected in the blood. Increased circulating PSA levels indicate a prostate abnormality [prostatitis (PTIS), benign prostatic hyperplasia (BPH), and prostate cancer (PC)], but levels vary widely among individuals. Since prostate has been proposed as an immune organ, we hypothesize that the variation in PSA levels may be due to presence of antibodies (Ab) against PSA. The present study was conducted to examine the presence of PSA Ab in sera of men with various prostate abnormalities using the enzyme-linked immunosorbent assay (ELISA). Absorbance ELISA values were converted to SD units. Taking $\geq$ 2 SD units as a cutoff for positivity, 0% (0/28) of normal men, 0% (0/25) with PTIS, 33% (10/30) with BPH, and 3.5% (1/29) with PC showed PSA Ab. These results are being confirmed using the Western blot procedure. These interesting findings may help in the specific diagnosis of the prostate abnormalities, especially in differentiating prostate cancer from BPH and PTIS.

Biological and Health Sciences Category

Bio & Health Sci Poster 21:

Effect of sleep disturbance on awareness of sleepiness

Hannah K. Ritchie, Amanda McBean and Hawley Montgomery-Downs

Department of Psychology, West Virginia University, Morgantown, WV 26505

Daytime sleepiness, a common consequence of sleep disturbance, is a major cause of vehicular and workplace accidents. To aid in prevention of accidents that stem from daytime sleepiness, it is necessary for one to be aware of his/her sleepiness. The purpose of this research is to explore participants' accuracy in predicting and recognizing sleep onset after both a healthy and disturbed night of sleep. Ten participants' awareness of sleepiness will be tested, using verbal questioning, prior to and following four nap opportunities during Multiple Sleep Latency Tests conducted before and after a night of sleep disturbance. Results of seven completed participants of this ongoing protocol significantly underestimated sleep onset latency both before (p=0.04) and after (p=0.03) the first nap opportunity. Participants' accuracy of predicting sleep onset did not significantly increase or decrease following a night of sleep disturbance (p>0.05). These results indicate that regardless of the prior night's quality of sleep, participants show poor overall ability to predict and recognize sleep onset. This may have implications for better understanding sleep-related accidents.

Bio & Health Sci Poster 22:

Effects of interferon-gamma on neuronal viability & mitochondrial function

Thomas K. Lavin[1], Danielle N. Doll[1], Stephanie L. Rellick[2] and James W. Simpkins[3]

[1]Center for Neuroscience, [2]School of Nursing, [3]Department of Physiology & Pharmacology, West Virginia University, Morgantown, WV 26506

Much of the damage done by stroke is due to pro-inflammatory cytokines that act on the brain following the initial ischemia. Pre-clinical studies have found IFN-γ, a pro-inflammatory cytokine, to be up-regulated post ischemia and animal models have found a decrease in infarct size in IFN-γ KO mice following experimentally induced stroke. The neurotoxic mechanism of IFN-γ remains unclear. In this study we tested the effects IFN-γ on HT-22 hippocampal neurons to determine if it induces cell death through mitochondrial dysfunction. Western Blot confirmed the presence of interferon-gamma receptors on HT-22 cells. Cell viability and mitochondrial function were measured at 24 and 48 hours using Calcein AM assays and a XF^{e}96 analyzer from Seahorse Bioscience respectively. Cell viability was not significantly decreased at either time point; however ATP production, spare capacity and maximum respiration were decreased at 24 and 48 hours. This data suggests a neurotoxic mechanism induced by IFN-γ relying on mitochondrial dysfunction. Future studies will explore the biochemical signaling pathways leading to IFN-γ induced mitochondrial dysfunction and its connection to neuronal death.

Biological and Health Sciences Category

Bio & Health Sci Poster 23:

Micropatterning of polymer films and layer-by-layer self-assembly

Shaylyn Walter[1], Ma Yingyi[2] and Wu Lixin[2]

[1]Department of Chemistry, West Virginia University, Morgantown, WV 26506
[2]State Key Lab of Supramolecular Structures and Materials, Jilin University, Jilin, China

Current routes to create ordered cell micropatterned films are complicated and require multi-step processes. A proposed method for creating highly ordered, microporous films and adsorbing ions into these pores by layer-by-layer self-assembly is discussed. A microemulsion was created using water and an organic solution containing polystyrene (PS), didodecyldimethylammonium bromide (DDAB), and dichloromethane. After the microemulsion was cast on the substrate, the water droplets fused together by convection and formed highly ordered pore templates. The evaporation of the water and remaining dichloromethane created a PS film with DDAB lined pores. Layer-by-layer self-assembly was used to adsorb deoxyribonucleic acid (DNA) and polyelectrolyte ion (PEI) cycles into the pores. The ordered film was obtained using 0.1 mg/mL DDAB in an atmosphere of 30 degrees Celsius and 40% humidity. Analysis of the film under optic and fluorescent microscopy revealed that electrostatic interactions allowed the DNA and PEI to adsorb inside the pores. Further work should focus on adsorbing cells into the pores by electrostatic interactions with the polyelectrolyte ions.

Bio & Health Sci Poster 24:

Hand bacterial communities: a tool for health diagnostics, forensic analysis, and human identification

Holly P. Whitelam[1], Amanda Holbert[2], Letha Sooter[2] and Jeremy Dawson[1]

[1]Department of Computer Science and Electrical Engineering, and [2]Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506

Recent studies on the human microbiome have discovered that bacterial communities residing on the palm of the hand are highly diverse and variable between individuals. Because of this, analysis of these bacterial communities may be used as a tool in non-invasive health diagnostics, human identification, and biometrics in conjunction with the current forensic methods. The goal of this project was to create a method of DNA extraction and 16S rRNA gene amplification that can yield a high enough DNA concentration for further sequencing and analysis. DNA extraction was achieved with a MoBio UltraClean Plant DNA Isolation kit. The 16S rRNA gene, a unique region of bacterial DNA that has both conserved species-specific variable regions, was then isolated and amplified through polymerase chain reaction. Results indicate that this method yields 10-80 ng/ul of DNA extracted from hand swabs, which is sufficient for subsequent sequencing. Later genomic sequencing and analysis of these bacterial communities will give insight into the possibilities of this being used as a new health diagnostics and human identification tool.

Biological and Health Sciences Category

Bio & Health Sci Poster 25:

Type II diabetes and leptin resistance: Implications for Alzheimer's disease

Kirsten E. Schoonover, Carolyn C. Rudy, Holly C. Hunsberger and Miranda N. Reed

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

Diabetes causes cognitive impairments and phosphorylation of tau (ptau), two hallmarks of Alzheimer's disease (AD). Our preliminary data suggests ptau increases extrasynaptic NMDA receptor (E-NMDAR) trafficking and decreases synaptic NMDA receptor (S-NMDAR) trafficking. These receptors possess opposing functions: S-NMDARs facilitate learning and memory, whereas E-NMDARs impair learning and memory. In the current study, hippocampal S-NMDARs and E-NMDARs levels were compared in diabetic mice without a functioning leptin receptor (db/db) and littermate controls with a functioning leptin receptor. The hippocampi of db/db mice and control littermates were fractionated to produce an insoluble "PSD-enriched" membrane fraction containing S-NMDARs, and a "non-PSD enriched" membrane fraction, which includes E-NMDARs. NMDARs in each fraction were compared using western blots. We hypothesize that db/db mice will exhibit an increase in E-NMDARs and a decrease in S-NMDARs compared to littermate controls, providing a possible mechanistic link among ptau, type II diabetes, AD, and the cognitive impairments observed in both diseases.

Bio & Health Sci Poster 26:

Comparison of NMDA receptor trafficking in Zucker rats

Alan G. Rejonis[1], Holly C. Hunsberger[1], Carolyn C. Rudy[1] and Miranda N. Reed[1]

[1]*Behavioral Neuroscience, Department of Psychology, West Virginia University, Morgantown, WV 26506-6040*

Diabetes causes memory impairments and increases tau phosphorylation (ptau), a pathological hallmark of Alzheimer's disease (AD). Our preliminary data suggests that ptau increases extrasynaptic NMDA receptors (E-NMDARs) expression, while decreasing the expression of synaptic NMDA receptors (S-NMDARs). These receptors have opposing functions as E NMDARs show negative effects on learning and memory and accelerate cell death, whereas S NMDARs facilitate learning and memory and prevent cell death. The current study compares expression of E-NMDARs and S-NMDARs in obese Zucker rats, one of the best rodent models of type 2 diabetes. The hippocampi of obese Zuckers and lean littermates were fractionated to produce an insoluble "PSD-enriched" membrane fraction containing S-NMDARs, and a "non PSD enriched" membrane fraction, which includes E-NMDARs. NMDARs in each fraction were compared using western blots. We predict an increase in E-NMDARs and a decrease in S NMDARs for obese Zuckers compared to lean littermates, an effect that could explain diabetes induced memory deficits.

Biological and Health Sciences Category

Bio & Health Sci Poster 27:

Novel Object Recognition: A Behavioral Assay for Assessing Whisker-Dependent Texture Discrimination in Mice

Ogaga N. Urhie, John Z. Cavendish and Ariel Agmon

Center for Neuroscience and Department of Neurobiology and Anatomy, West Virginia University, Morgantown, WV, 26506-9304

Mice use whiskers (vibrissae) to gather tactile information from the environment. We study the nature and processing of neural information gathered and the role of vibrissal sensation in behavior. We used a texture-based Novel Object Recognition (NOR) assay to evaluate whisker-dependent sensory acuity in mice; we plan to use the assay in optogenetic studies to assess the role of subsets of somatosensory cortical neurons in texture discrimination. NOR takes advantage of a mouse's natural tendency – without training or external motivation – to explore novel objects more than familiar ones. We presented pairs of objects covered in varying grades (coarseness) of sandpaper to mice – first two identical grades, then one novel and one familiar grade. A longer time spent exploring the novel object was indicative of a detection of textural differences. Excluding mice with poor memory allowed us to determine the minimum detectable difference in sandpaper grade to quantify sensory acuity. We will be expanding on previous work by determining the role of active whisking in texture discrimination and the number/identity of whiskers important for such discrimination.

Bio & Health Sci Poster 28:

Effects of diet and exercise on inflammatory markers in breast cancer survivors

Derek Andreini[1], Anne Swisher[2] and Linda Vona-Davis[3]

Departments of [1]Surgery and [2]Human Performance and Physical Therapy, Breast Cancer Research Program, Mary Babb Randolph Cancer Center, West Virginia University, Morgantown

Inflammatory markers are used to measure the state of overall health during breast cancer survival. By maintaining healthy weight through diet and exercise, breast cancer survivors may reduce signs of inflammation. We hypothesized that a twelve week intervention program post treatment for breast cancer would reduce inflammatory markers in the blood. A total of 28 breast cancer survivors participated in the study at WVUH. Women were randomized to receive intervention (n=18) or control (n=10). Blood was collected from all women before and after the 12-week intervention period. Levels of inflammatory markers were measured using a MSD multi-spot assay system. Statistical analysis was performed using SAS Jmp version 10. We calculated the delta value for each marker which represented the change between pre and post intervention. Included in the analysis was the number of recorded days that women participated in exercise. Results thus far show that women who exercised and controlled their diet had lower levels of C-reactive protein, but the difference was not significant. Further analysis is ongoing.

Biological and Health Sciences Category

Bio & Health Sci Poster 29:

Conjugated linoleic acid and weight loss in mice

Vincent Dartigue, Kimberly M. Barnes and Quinnan Chen

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

Conjugated linoleic acid (CLA) is a fatty acid being sold commercially as a solution to weight loss. The purpose of this experiment was to determine the effects of adding CLA to the diet by impacting white adipose tissues conversion to brown adipose tissues. Brown adipose tissues have a higher rate of fatty acid oxidation than white adipose tissue. Therefore, to determine rate of oxidation, the activity of 8 genes including uncoupled protein 1, 2, 3 and lipoprotein lipase will be studied. RNA was extracted from adipose tissue collected from 95 mice of varying breeds being fed a soy, coconut, Conjugated linoleic acid+soy or Conjugated linoleic acid+coconut diet. Reverse transcription of the RNA was performed, and then combined with reverse and forward primers for each gene to undergo real-time polymerase chain reaction. Results are still being gathered as it is a long and tedious process. This project will be extended to the fall semester where at that point all the results will be in and processed and finalize

Bio & Health Sci Poster 30:

Different sources of omega-3 fatty acids on lipogenic gene expression of cardiovascular disease risk factors

Brooks Paine, Kaitlin Mock, Vagner Benedito and Janet Tou

Division of Animal and Nutritional Sciences and Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506-6045

Omega-6 polyunsaturated fatty acid Linoleic Acid (LA, 18:2n-6) and omega-3 polyunsaturated fatty acid α-linolenic acid (ALA, 18:3n-3) are essential fatty acids, therefore they must be obtained through their diet. Omega-3 fatty acids EPA and DHA can be synthesized from ALA, however the conversion rate is very low (about 5%). In recent studies, male rats provided consumption of EPA and DHA have been shown to reduce cardiovascular disease risk factors such as plasma triglycerides and cholesterol by down regulating lipogenic gene expression. The purpose of this study is to determine the effects of different omega-3 sources on liver lipid metabolism. Female rats were fed diets containing the different omega-3 sources of 1) corn oil, 2) flaxseed oil, 3) salmon oil, or 4) tuna oil for a time period of eight weeks. Calorimetric assays were used to analyze serum lipoproteins. Essential fatty acids in the liver were determined by gas liquid chromatography. mRNA was extracted, and lipogenic gene expression regulators SREBP-1c and PPARα were analyzed through RT-PCR. Results are still in progress.

Biological and Health Sciences Category

Bio & Health Sci Poster 31:

Cortical representation of mimicable animal sounds

Hayley Still and James W. Lewis

Center for Advanced Imaging; West Virginia University Department of Physiology and Pharmacology, Morgantown, WV 26506 USA

How is the human brain organized to process different types of real-world sounds? One theory postulates that embodiable sounds (actions and vocalizations) are processed relative to representations of the self. To test this idea we re-analyzed data from three earlier 3T fMRI scanning paradigms, wherein participants listened to animal action or vocalization sounds and performed simple tasks. Non-scanning participants rated these animal sounds on their degree of "mimicability" using a 4 point Likert-type scale. These ratings were used to compare across data sets how the brain processes mimicable vs. non-mimicable sounds. We *hypothesized* that mimicable vs non-mimicable sounds would preferentially activate different cortical networks of the human brain, and that mimicable sounds would elicit more cortical representation. We observed a double dissociation of cortical networks for processing mimicable sounds, notably posterior cingulate and medial prefrontal vs. parahippocampal cortices. These findings suggest that the human brain evokes two differing processing strategies: one includes a "mentalizing network" for sounds that are deemed embodiable (representation of self), and one for non-embodiable sounds, which entail general object recognition networks.

Agricultural and Environmental Sciences Category

Ag & Env Sci Index:

Poster 1: *Plant-microbe interactions for increased plant performance in Sorghum.* **Jared Baird**, Michael Carlise, Jonathan Cumming & Jennifer Hawkins.

Poster 2: *Could environmental variability have inflicted more damage to tree species during Hurricane Sandy?* **Ty Z. Heimerl**, Brenden E. Mcneil & Christopher Walter.

Poster 3: *The differential effects of AM fungi on the aluminum tolerance of Medicago truncatula.* **Chibuzor Ejimofor**, William Gabonay, Benjamin Clites & Jonathan Cumming.

Poster 4: *A comparison of observed plasma sheet temperatures with temperature predicting models.* **Robert Gardner** & Amy Keesee.

Poster 5: *Does shale gas development play a role in listing prices of homes?* **Amanda Harker** & J. Wesley Burnett.

Poster 6: *Examining the effects of thermally-degraded nanoclay enforced polylactic acid composite on cellular systems.* **Savannah Sims**, Reem Eldawud, Sushant Agarwal, Rakesh K Gupta & Cerasela Zoica Dinu.

Poster 7: *Effects of weight loss on oxidant status in mature light-type horses.* **E. Hannah Hoblitzell**, Kim Barnes, Jennie Zambito & Holly Spooner.

Poster 8: *The effect of extended nitrogen fertilization on soil respiration within Appalachian forest ecosystems.* **Ross Whitehead** & William Peterjohn.

Poster 9: *Historical trends in stomatal function using herbarium specimens.* **Daniel Walton**, Richard Thomas, Philip Crim, Leigh Ann Scholtz, Justin Mathias & Kenneth Smith.

Poster 10: *Development of a method for acquiring higher yields of ergot alkaloids from modified Aspergillus nidulans.* **Katrina Schlum**, Katy Ryan & Daniel Panaccione.

Poster 11: *Cloning and analysis of putative copper transporter in Medicago truncatula root nodules.* **Ashley Geraets**, Christina Wyman, Lina Yang & Vagner Benedito.

Poster 12: *Stable isotope composition in two streams located in the Fernow Experimental Forest.* **Maria Cuevas**, David Young & Nicolas Zegre.

Poster 13: *DNA preparation, sequencing, and genetic variation of Populus trichocarpa.* **Sandra Simon**, Stephen DiFazio & Eli Rodgers-Melnick.

Poster 14: *Analysis of fish plasma and steroid separation using capillary electrophoresis.* **Rachel White**, Vincent Nyakubaya, Lisa Holland & Jennifer Stueckle.

Poster 15: *The effect of tree species diversity on forest productivity in the United States.* **Eric King**, James Wattson & Jingjing Liang.

Agricultural and Environmental Sciences Category

Poster 16: *Urea Transporter gene expression in, model organism, Medicago truncatula.* **Christopher Bell** & Vagner Benedito.

Poster 17: *Effects of weight loss on lipid metabolism in obese horses*. **Morgan Bush**, Kimberly Barnes, Jennie Zambito & Holly Spooner.

Poster 18: *Creation of inverted hybrid organic photovoltaic cells in the aqueous phase.* **Andy Maloney**, Chen Zhaolai & Yang Bai.

Poster 19: *Damage from Superstorm Sandy differs by tree size and species.* **Dara Erazo**, Brenden McNeil, Ty Heimerl, Christopher Walter & Mary Adams.

Poster 20: *Effects of n-3 PUFAs and/or SPI diet supplementation on PLD inflammationin rats.* **Matthew Brooks**, Kaitlin Maditz & Janet Tou.

Poster 21: *Effects of consuming different protein and oil sources on development and progression of Polycystic Kidney Disease in rat kidney tissue.* **Nainika Nanda**, Chris Oldaker, Kaitlin Maditz & Janet Tou.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 1:

Plant-microbe interactions for increased plant performance in *Sorghum*

Jared M. Baird, Michael R. Carlise, Jonathan R. Cumming and Jennifer S. Hawkins

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

The production of grain crops requires high levels of agriculturally unfriendly chemicals in the form of fertilizers and pesticides. Therefore, there is a need to engineer low-input/high-yielding crops to alleviate strains on future generations' available resources. One focus is to understand symbiotic relationships among plants and their associated microbes that lead to increases in nutrient efficiency. Several studies suggest that positive interactions among mycorrhizal fungi and plants are genetically controlled; however, this hypothesis has yet to be tested within any representative species of grain crops. In this study, we utilize an inter-specific recombinant inbred line (RIL) population constructed from a cross of *Sorghum bicolor* and *Sorghum propinquum* to locate positive genotypes responsible for increased favorable interactions with mycorrhizal fungi. Thus far, results have shown that individuals in the RIL population do vary in growth rate and nutrient efficiency when exposed to the fungi. The results of this study will ultimately lead to the discovery of genomic regions controlling associations with mycorrhizal fungi in *Poaceae*, which includes key crops such as maize, wheat and millet.

Ag & Env Sci Poster 2:

Could environmental variability have inflicted more damage to tree species during Hurricane Sandy?

Ty Z. Heimerl, Brenden E. Mcneil and Christopher Walter

Department of Geography & Geology, West Virginia University, Morgantown, WV 26505-6045

Hurricane Sandy has been one of the most talked about and costliest disasters in United States history due to implications with climate change, and in particular with this study a huge economic hit for the forest management industries of West Virginia. The goal of this study is to find a relationship between spatial variables in a forest that may have lead some forest types to sustain more damage than others when large storms like Sandy occur in the future. Our hypothesis is that damage is different in plots depending on abiotic factors. Results were found by using data collected by categorical tree assessment in individual trees over different plots in watersheds in the Fernow Experimental Forest in Parsons, WV using the Chris Peterson seven-category protocol method combined with data on the slope, elevation, and distance to streams of each plot. Currently we are using a logistic regression model with our data and the results are leaning towards certain environmental variables may have caused more damage to trees from Hurricane Sandy.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 3:

The differential effects of AM fungi on the aluminum tolerance of *Medicago truncatula*

Chibuzor K. Ejimofor, William Gabonay, Benjamin Clites and Jonathan R. Cumming

Department of Biology, West Virginia University, Morgantown, WV 26505, USA

Aluminum (Al) toxicity is the greatest factor limiting plant growth in acidic soils, which account for forty percent of the Earth's soil. The typical plant response to Al toxicity is the release of carbon in the form of organic acids (OA) which chelate and detoxify Al in the rhizosphere. Many plants form symbiotic associations with arbuscular mycorrhizal (AM) fungi in the soil, and this may confer Al resistance to the plant by influencing OA exudation. The purpose of this experiment is to investigate the differential effects that AM fungi have on the aluminum tolerance of *Medicago truncatula.* The experiment included ten treatments comprised of two factors: (1) concentrations of Al ranging from 0 to 50 μM and (2) the presence or absence of symbiosis with AM fungi. There was no apparent benefit of AM fungi on plant growth. No statistical significance was found between tissue concentrations of Al, calcium, or phosphorus and Al treatment level. Levels of exuded OA are currently being analyzed using ion chromatography for trends in Al treatments and AM association.

Ag & Env Sci Poster 4:

A comparison of observed plasma sheet temperatures with temperature predicting models

Robert Gardner and Amy Keesee

Department of Physics, White Hall, West Virginia University, Morgantown, WV 26505-6315

The Earth's magnetosphere is the region in which the paths of ions and electrons are guided by Earth's magnetic field. When this area experiences a disturbance, the result is referred to as a geomagnetic storm, of which the most common source emerges from variances in solar wind output. The plasma sheet is a portion of the magnetosphere found along the equatorial plane of the magnetosphere, containing denser plasma and lower magnetic field strength. Temperature measurements taken in the plasma sheet by TWINS-1 aboard the USA-184 satellite and TWINS-2 aboard the USA-200 were compared with temperature calculations generated from two separate temperature models. The first of which (Borovsky) was solely dependent on the solar wind velocity, and the second of which (Tsyganenko) was dependent on velocity, position, and magnetic field. Recorded temperatures were plotted alongside these models with respect to time. Although it is understood that the solar wind velocity largely controls the temperature changes in the plasma sheet, the intervals of disagreement indicate some heating mechanism other than driving by the solar wind.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 5:

Does shale gas development play a role in listing prices of homes?

Amanda J. Harker and J. Wesley Burnett

Department of Resource Management, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, Morgantown, WV 20506

With the boom of the natural gas industry, and promises of future energy security if we continue to expand America's resources, many questions are arising about what economic impacts it is creating. This research analyzes the effects of Texas Barnett Shale Gas development on median housing listing values in the core, non-core, and surrounding counties of development as listed by the Texas Rail Road Commission. Listing values for homes can be determined by many contributing factors, including physical location relative to other homes and diversions. Housing prices are one of the largest indicators of economic growth or downfall. This research compared long-term and short-term average median listing prices to the amount of shale gas development in particular counties within and surrounding development. Results are still currently being collected. By analyzing these effects this research aims to determine if shale gas development has either a positive or negative relationship with housing prices in order to understand the larger economic impact.

Ag & Env Sci Poster 6:

Examining the effects of thermally-degraded nanoclay enforced polylactic acid composite on cellular systems

Savannah Sims, Reem Eldawud, Sushant Agarwal, Rakesh K Gupta and Cerasela Zoica Dinu

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

Polylactic acid (PLA), a naturally hydrophilic polymer, has been widely used in food packaging applications because of its biocompatibility and non-toxic degradation. However, the mechanical properties of PLA alone when used in food packaging can be altered upon environmental exposure. PLA reinforced with nanoclays has been proposed as an alternative to reduce such alterations and create PLA-based nanocomposites. The nanoclays have been shown to impact the polymer's mechanical properties by improving strength, heat resistance, percolation properties, and increasing its thermal stability. Due to nanocomposite usage in food packaging, the environmental exposure, disposal, and residue impact of these materials onto biological systems must be assessed. This research focuses primarily on examining the effects of nanoclay-enforced PLA nanocomposite on cellular systems. For these experiments, PLA was mixed with nanoclay and thermally degraded at different conditions. Scanning Electron Microscopy (SEM), Energy-dispersive X-ray spectroscopy (EDX), and solubility tests were used to analyze the physical and chemical properties of the nanocomposites upon thermal degradation. The biological effects of nanocomposites and their thermally degraded counter parts were studied in relation to human lung epithelial cells (BEAS-2B). Measuring the cellular viability, proliferation, and changes in cellular morphology at varying time points show that the thermal degradation of the nanocomposites drastically impact the cellular systems. This evidence can provide insight into the biodegradation of nanocomposites and the effects of such degradation on the environment.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 7:

Effects of weight loss on oxidant status in mature light-type horses

E. Hannah Hoblitzell[1], Kim M Barnes[1], Jennie L. Zambito[1] and Holly S.Spooner[2]

[1]Davis College of Agriculture, Natural Resource, and Design, West Virginia University, Morgantown, WV 26506. [2]School of Agribusiness and Agriscience, Middle Tennessee State University, Murfreesboro, TN 37129

Obesity in horses causes numerous biological changes, including increased damage to cellular constituents by free radicals and reactive species. Weight-loss is often considered to be an optimal method to prevent excessive damage by reactive molecules, therefore we hypothesized that weight-loss would reduce overall oxidant status. Eight light-type, mature (5-12 years) mixed-sex horses were maintained at an obese phenotype for baseline sampling, then placed on a 30% caloric restriction and light exercise weight-loss plan (WLP) for six weeks to reach moderate body condition. Oxidant status was determined through blood analysis of glutathione (GSH), and glutathione peroxidase (GPx), which work together to reduce hydrogen peroxide to water, along with nitric oxide (NO), a free radical. Overall, horses lost an average of 7.9% of their original body weight, and all horses reached target body condition. Preliminary assessment of data suggests variable changes in NO and GSH parameters when evaluating baseline to endpoint parameters. Further statistical analysis is needed to elucidate changes associated with weight-loss on these parameters with regard to health benefits in the horse.

Ag & Env Sci Poster 8:

The effect of extended nitrogen fertilization on soil respiration within Appalachian forest ecosystems

Ross Whitehead and William Peterjohn

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

It is thought that approximately 26 percent of anthropogenic carbon emissions are sequestered within terrestrial forests, particularly within the forests of mid-latitude deciduous forests. Nutrient interactions are complex, and the impact of changes in nitrogen availability with regards to the carbon cycle is poorly understood. To study the impact of these changes, two watersheds within the Fernow experimental forest were selected for study, one which receives regular nitrogen fertilization, and one which does not. Soil respiration was measured in 14 locations within each watershed with the use of portable infrared gas analysis equipment. Root density for both the organic and mineral horizons was measured by extracting soil samples at each location and separating the roots from the soil by hand. Preliminary results suggest that nitrogen fertilization significantly impacts both the quantity of fine root mass and the dynamics of its growth. This has consequences for how carbon is sequestered within forest soils, and larger implications for global climate change.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 9:

Historical trends in stomatal function using herbarium specimens

Daniel R. Walton, Richard B. Thomas, Philip M. Crim, Leigh Ann Scholtz, Justin M. Mathias and Kenneth R. Smith

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

Increasing atmospheric carbon dioxide concentrations have been correlated with reduced leaf stomatal density and a possible increase in guard cell length. These changes potentially result in a net decrease in foliar water transpired, as well as stomatal conductance to CO_2. It is unclear, however, how these anatomical and physiological responses impact intrinsic water use efficiency (*iWUE*, i.e. the ratio of assimilated carbon to stomatal conductance). Changes in *iWUE* may have repercussions on landscape scale carbon and water cycling, as well as tree growth and terrestrial carbon sequestration. Stomatal density and iWUE were examined using herbarium specimens of five Central Appalachian tree species dating back 100 years or more. Species analyzed included *Acer saccharum, Fagus grandifolia, Juniperus virginiana, Quercus prinus,* and *Picea rubens.* Stomatal frequency and guard cell lengths were ascertained from the leaf peels and carbon isotope ratios were used to determine intrinsic water use efficiency. Negative correlations are expected between increased atmospheric CO_2 with stomatal density and guard cell length. An overall positive correlation is expected for increased atmospheric CO_2 and iWUE.

Ag & Env Sci Poster 10:

Development of a method for acquiring higher yields of ergot alkaloids from modified *Aspergillus nidulans*

Katrina A. Schlum, Katy L. Ryan and Daniel G. Panaccione

Division of Plant & Sciences, West Virginia University, Morgantown, WV 26505

Ergot alkaloids are mycotoxins that are beneficial as pharmaceuticals but harmful in agricultural settings. Currently, the early steps of the ergot alkaloid pathway are only partially understood; thus, a mutant *Aspergillus nidulans* strain was previously generated which contains the first two genes in the pathway *dmaW, easF*, and the proposed third gene *easC*. These genes are from the ergot alkaloid gene cluster of *Aspergillus fumigatus*. This transformant accumulates an uncharacterized ergot alkaloid at insufficient levels for proper verification of its chemical structure. The aim of our study is to determine the conditions best-suited for producing and extracting higher concentration of the unknown metabolite. Therefore, we investigated the effect of different media on ergot alkaloid production. We hypothesized that if we grew the mutant strain on a medium containing tryptophan and a source of dimethylallylpyrophosphate, the first compounds in the pathway, ergot alkaloid production would be up-regulated. We also experimented with different ergot alkaloid extraction procedures to obtain increased yields of product. Higher yields of product will facilitate further structural analyses of this important compound.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 11:

Cloning and analysis of putative copper transporter in *Medicago truncatula* root nodules

Ashley Geraets, Christina Wyman, Lina Yang and Vagner Benedito

Division of Plant and Soil Science, West Virginia University, Morgantown, WV 26506

Proper plant development is dependent on nitrogen uptake from the environment. However, plants lack the ability to directly utilize atmospheric nitrogen. *Medicago truncatula*, a model legume, forms a symbiotic relationship with rhizobia *Sinorhizobium meliloti* that allows the legume to fix nitrogen and results in the formation of a nodule. The exact role of copper during nitrogen fixation is largely unknown. We hypothesize that copper may play a role in maintaining nodule development and is an essential nutrient in redox reactions in root nodules. For Cu^{2+} to reach the location where nitrogen fixation occurs, it needs to cross biological membranes with the intermediation of transporters. Contig 60484 encodes a putative copper transporter with three transmembrane domains expressed solely in the nodules. Gene expression analysis of the gene was characterized through RT-qPCR during nodule development. The cDNA of this gene was cloned into entry vectors to identify gene products through GFP fusion and gene function studies. This research will contribute to the process of biological nitrogen fixation, which is an essential component of sustainable agriculture.

Ag & Env Sci Poster 12:

Stable isotope composition in two streams located in the Fernow Experimental Forest

Maria Cuevas, David Young and Nicolas Zegre

Forestry Division, West Virginia University, Morgantown WV 26505

The isotopic composition of water is important in determining where the water goes when it rains, what flowpaths the water takes, and how long water resides in the watershed. Change in the stable isotope composition of a stream results from mixing and well-known fractionation processes that occur during evaporation and condensation. The streams isotopic composition is expected to change, water closer to the stream source should contain heavier isotopes while the ratio of heavy to light oxygen and hydrogen isotopes should shift with an increase in lighter isotopes farther downstream. Streams Camp Hollow and Big Spring Run, located in the Fernow Experimental Forest, were sampled every hundred meters and where a tributary joined the main stream. Samples were then analyzed using an Isotope Mass Spectrometer, interpreted using a Los Gatos Excel spreadsheet, and compared to the Local Meteorological Water Line. Further work in characterizing streams by their isotopic composition can used to calculate evaporation rates as well as recharge rates and to create a hydrograph which quantifies the source of the water components.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 13:

DNA preparation, sequencing, and genetic variation of *Populus trichocarpa*

Sandra Simon, Stephen DiFazio and Eli Rodgers-Melnick

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

With the relative ease of genetic analysis using Next Generation Sequencing there is demand for less expensive methods of DNA preparation. Current research in the DiFazio Laboratory at West Virginia University is focused on genome sequencing of entire populations of *Populus trichocarpa*. However, the expense of present methods used for preparing genomic DNA has limited the number of samples that can be sequenced. In this study, we explored a new method of DNA library construction to help develop a procedure that will allow the genome sequencing of entire populations to be performed effectively in both time and cost. We used blunt-end ligation of sequencing adapters, and Carboxyl-modified Sera-Mag Magnetic Speed-beads for purification. After DNA libraries were completed the average concentration was 46.7 nanograms per microliter with fragment sizes ranging from 603-872 base pairs. Individuals were also genotyped by performing a sequence capture assay and through use of the Illumina MiSeq genome analyzer. Our results show that library preparation using this method can greatly decrease costs, increase effectiveness, and expand the uses of Next Generation Sequencing.

Ag & Env Sci Poster 14:

Analysis of fish plasma and steroid separation using capillary electrophoresis

Rachel D. White[1], Vincent T. Nyakubaya[1], Lisa A. Holland[1] and Jennifer L. Stueckle[2]

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

Environmental studies have revealed that pollutants in rivers and lakes cause endocrine disruption in fish. While this leads to feminization in males and impairs fertility in fish, these contaminants can also affect human health and fertility. The purpose of this research is to adapt a pH stacking method to simultaneously separate and quantify steroids in low volume plasma samples from model fish used to study toxicity. Stacking-electrophoresis is the only method that can separate and detect multiple steroids from ≤ 5 microliter volumes of sample in only 5 minutes. Unlike other methods, analysis of circulating steroids is an immediate indicator of endocrine disruption and a direct link to plasma. Following exposure to endocrine disruptors, the capillary electrophoresis method demonstrated that testosterone, ketotestosterone, 17α,20β-dihydroxypregn-4-en-3-one, estradiol, and estrone increased in female Japanese Medaka fish. More studies may reveal that other endocrine disruptors also alter circulating steroids, thereby causing endocrine disruption. This method provides information that can potentially link human exposure to pollutants to an observable increase in human diseases and conditions related to endocrine disruption.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 15:

The effect of tree species diversity on forest productivity in the United States

Eric M. King, James V. Wattson and Jingjing Liang

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

While substantial evidence of a positive diversity-productivity relationship (DPR) in planted grassland experiments exists, whether or not this observation applies to natural forest ecosystems is largely unknown. This study addresses this question in regard to the forests of the United States as well as the variation in DPRs among the country's different forest types through the geographic and statistical analysis of USDA Forest Inventory Analysis (FIA) data and forest type group data from the United States Forest Service. A correlation of 0.252 ($p < 0.0001$) was found between the number of tree species and site productivity (growth in cm^3/acre/year), and a multiple regression equation predicting national site productivity yielded a coefficient of 1.529 for the number of species variable. This coefficient varied substantially across forest type groups, the lowest significant ($p = 0.015$) value being -5.426, pertaining to the alder/maple group, and the western oak group claiming the highest significant ($p < 0.0001$) value of 7.680. Greater forest productivity has numerous implications, including greater industrial wood crop production and a higher rate of carbon sequestration.

Ag & Env Sci Poster 16:

Urea Transporter gene expression in, model organism, *Medicago truncatula*

Christopher Bell and Vagner A. Benedito

Davis College of Agriculture, Natural Resources and Design, Division of Plant and & Soil Sciences, West Virginia University, Morgantown, WV 26506

Nitrogen plays a fundamental role in the growth of all plants. In agriculture the majority of plants cannot fix nitrogen and require fertilization to yield crops. The purpose of research on the model organism *Medicago truncatula* is to study the expression of genes as a plant grows in a symbiotic relationship with nitrogen-fixing soil bacteria, rhizobia. The gene Medtr5g026640 is a putative urea transporter which is expressed throughout the organism from germination to death. We hypothesize that this gene plays a large role in the nitrogen fixation physiology of legumes by allowing fixed nitrogen to flow from the root nodules to other organs of the plant. During research we will add the construct into agrobacerium to later transform plants. The main goals of my project are to: 1) clone the cDNA of this putative transporter to allow for analyzes of the functional properties of the gene product, such as substrate affinity and genetic complementation assays; and 2) better understand the transcriptional profile of this gene via qPCR and mining of available databases.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 17:

Effects of weight loss on lipid metabolism in obese horses

Morgan L. Bush[1], Kimberly M. Barnes[1], Jennie L. Zambito[1] and Holly S. Spooner[2]

[1]Davis College of Agriculture, Natural Resource and design, West Virginia University, Morgantown, WV 26505, [2]School of Agribusiness and Agriscience, Middle Tennessee State University, Murfreesboro, TN 37129

Obesity currently affects over half of the nation's horses, and causes concern as it poses increased disease risks and impairs various metabolic functions. Weight-loss is considered a viable option to correct any maladies. This study was conducted to determine if weight-loss affected markers of lipid metabolism. Eight, mixed sex horses (5-12 yr) were kept at obese body condition (7-8 out of 9) for two weeks, then entered a six week period of 30% caloric restriction and light exercise to reach moderate body condition (5 out of 9). Blood samples collected weekly were analyzed for non-esterified fatty acid (NEFA) and triglyceride concentration. Neck fat biopsies were also collected, immediately underwent a lipolysis assay and were later analyzed for NEFA and free glycerol. Preliminary results indicate as horses lose weight, NEFA concentration in blood and lipolysis media demonstrates a decrease, while triglyceride decreases in blood, but free glycerol is variable in media. Further statistical analysis needed to determine significance. This study is unique in showing effects of weight loss on obese horses, rather than effects of obesity.

Ag & Env Sci Poster 18:

Creation of inverted hybrid organic photovoltaic cells in the aqueous phase

Andy Maloney, Chen Zhaolai and Yang Bai

State Key Lab of Supramolecular Structure and Materials, Jilin University, Changchun, China

Currently, alternative energy solutions are being considered as options to replace fossil fuels. Though most industry practices focus on silicon based solar cells, organic photovoltaics are being examined. One major concern in these photovoltaics is finding suitable materials for the active, or light collection, layer. In this work, the use of different transition metal complexes in the active layer of cells was studied. We were able to show the inadequacy of a metal complex, CuInS, while also confirming the sufficiency of CdTe. We were able to construct cells with a PCE of 1.06%. Additionally, the mechanism that makes CdTe an appropriate material in cells and the importance of the ratio of electron donor to electron acceptor in the active layer of solar cells was inspected. It was determined that the mechanism involves creation of CdS, but the orientation has yet to be finalized. In future work, we hope to further understand and replicate the CdTe mechanism in other cells. Additionally, we hope to create cells using a more suitable organic polymer and obtain larger efficiencies.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 19:

Damage from Superstorm Sandy differs by tree size and species

Dara Erazo[1], Brenden McNeil[1], Ty Heimerl[1], Christopher Walter[2] and Mary Adams[3]

[1]Department of Geology and Geography; [2]Department of Biology, West Virginia University, Morgantown, WV 26505; [3]USDA Forest Service, Parsons, WV 26387

Forests provide large economic and environmental benefits. With the increased frequency of severe weather in a changing climate, it is important to understand how severe weather impacts forest health and regeneration. On October 30, 2012, Superstorm Sandy dumped over three feet of wet, heavy snow onto many forests in West Virginia, causing power outages and road closures. This severe forest damage is also likely to have a lasting impact on forest health and regeneration. To understand the size- and sepecies-specific effects of storm damage, we made visual observations of damage on 3,550 individual trees located in seven watersheds of the Fernow Experimental Forest in Parsons, WV. We found that 65% of the understory trees were damaged, while only 31% of the canopy trees were damaged. Over 80% of the understory species of striped maple were damaged. In the canopy, only 14% of tulip-poplar trees were damaged compared to 50% for American beech. These size and species-specific damage rates have important implications for managers trying to maintain economic and environmental benefits from forests under climate change.

Ag & Env Sci Poster 20:

Effects of n-3 PUFAs and/or SPI diet supplementation on PLD inflammation in rats

Matthew J. Brooks, Kaitlin H. Maditz and Janet C. Tou

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

Polycystic liver disease (PLD) is a heritable disease characterized by renal and liver cyst formation leading to altered liver function. Studies have shown soy protein isolate (SPI) can protect against chronic liver disease and that omega-3 polyunsaturated fatty acids (n-3 PUFAs) can decrease inflammation. Female pck rats (age 28 days) were randomly assigned (n=12/group) diet regimens consisting of casein+corn oil (Casein + CO), casein+soybean oil (Casein + SO), SPI+soybean oil (SPI + SO), or SPI+1:1 soybean/salmon oil (SPI + BLEND) over a 12-week period. The liver tissue fatty acid composition was comparatively analyzed using gas chromatography (Interpretation still in Progress). The differences in tissue composition lead to differences in gene expression. mRNA has been extracted and isolated from the liver tissue and gene expression for NFkB/IKBα, COX-2, TNFα, AT-1, Nrf2, and CFTR is currently being analyzed using qPCR. These genes are currently targeted inflammation markers in pharmaceutical treatments for PLD but may be better regulated through diet. Results in Progress.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 21:

Effects of consuming different protein and oil sources on development and progression of Polycystic Kidney Disease in rat kidney tissue

Nainika Nanda, Chris Oldaker, Kaitlin Maditz and Janet Tou

Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources and Design, West Virginia University, Morgantown, WV 26506

Polycystic kidney disease (PKD) is a genetic disorder characterized by multiple cyst formation increasing renal size, structural damage, and loss of function. Few studies have examined the role of diet in PKD. The study objective was to investigate whether soy protein isolate (SPI) and/or omega-3 polyunsaturated fatty acid (n-3 PUFA) supplementation attenuates PKD progression. Young (age 28 d) female disease model rats (n=12/group) were fed diets consisting of casein + corn oil (Casein + CO), casein + soybean oil (casein + SO), SPI + soybean oil (SPI + SO), or SPI + 1:1 soybean/salmon oil (SPI + blend) for 12-weeks. Kidney weights were highest in the SPI + blend group. Histology showed interstitial inflammation, fibrotic changes, interstitial matrix deposition, and structural effacement in all groups. Fatty acid analysis is in progress. mRNA was extracted, and gene expression of pro-inflammatory COX-2 and cell proliferation factors, mTOR and MAPK1, was analyzed using qRT-PCR. SPI + SO exhibited reduced COX-2 expression (P=0.02). Lowered COX-2 indicates reduced renal inflammation, suggesting SPI + SO could attenuate PKD symptoms.

Physical Sciences and Engineering Category

Phys Sci & Eng Index

Physical Sciences and Engineering Category

Poster 16: *An analysis of models of black hole – neutron star binary systems.* **April Liska**, Duncan Lorimer, Samuel Bates, Michal Dominik, Kevin Stovall, Fredrick Jenet, Matthew Benacquista & Chris Belczynski.

Poster 17: *The implementation of a virtual reality system for the purpose of neuroscience research.* George Spirou, Gianfranco Doretto, **Quinn Jones**, Michael Morehead, Jared Blatt[2] & Tamountonye Iyalla.

Poster 18: *Tools for analyzing real-world wireless networks.* **Wei-Ting Chang**, Salvatore Talarico & Matthew Valenti.

Poster 19: *Determining optimal methodology for studying biomolecular transformations in IMS^2 and OMS devices.* **Samuel Miller**, Mahdier Khakinejad & Stephen Valentine.

Poster 20: *Biometric technology for the enhancement of rapid analysis methods for degraded DNA.* **Jordan Drew**, Allyce McWhorter, Emanuela Marasco, Jeremy Dawson & Tina Moroose.

Poster 21: *Optimization of Liquid Spray Cooling in a Variable Gravity Environment*. **Michael Powell**, Spencer Elyard, Evan Ford, Dustin Fronaphel, Stephen Itschner, Joseph West, Jacob Cordonier, Nicholas Underwood, Mohammad Rosli, Samantha Dolin, Steven Kosko & John Kuhlman.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 1:

Applying The Art Gallery Theorems to the WVU Creative Arts Center: A Problem in Computational Geometry

Alyssa S. Diaz, Donna E. Jackson, Ephraim A. Pittore, Adam J. Strong and Margie Darrah

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

The shape of the Creative Arts Center (CAC) at WVU makes it hard for security cameras to view every area of the building. To view the main hallway alone one would need the strategic placement of several security cameras with different angles of aperture. This leads us to the following question: What is the minimum number of security cameras required to secure all areas of the CAC? By using computational geometry and considering the shape of each room (classified as a specific polygon) we use the ideas behind the famous Art Gallery Theorems to investigate this question. The results are presented and describe the fewest number of security cameras needed to guard every room accessible to the public. Many factors influence the results here including the viewing angle of the security cameras, the placement of cameras and cost. The significance of this study includes using geometry to determine the overall optimal placement (and cost) of cameras to secure irregularly shaped buildings.

Phys Sci & Eng Poster 2:

Investigating Cycles of Array Sequences

Alyssa S. Diaz, Donna E. Jackson, Ephraim A. Pittore, Adam J. Strong and Ryan Hansen

Department of Mathematics, West Virginia University,Morgantown, WV, 26505

Recursive and iterative functions play a major role in both mathematics and computer science. They are useful for generating “good solutions” to difficult problems through dynamic programming as well as for finding special sequences. In this research, 2xn arrays were created where the top row of the array is made of positive integers [e.g. (1,2,3,4…)] and the bottom row is a list of random integers in any order. The next array in the sequence is created in the following way: the top row is a list of all of the integers that appear in the top row of the previous array, the bottom row is a list of counting numbers that indicate how many times the integer above it appears in the previous array. This process is repeated until a single array repeats itself (or a set of arrays is repeated). We speculate that no matter what array that was chosen to start with, this sequence would result in a repetitive cycle. We investigate this question as well as others pertaining to cycles of arrays.

Physical Sciences and Engineering Category

Phys Sci & Enq Poster 3:

Designing an interferometer to better analyze quantum dot emissions

Edward B. Flagg and Walter D. Baker Jr.

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

The field of quantum information science (QIS) is a fast growing one. Research in QIS will help develop devices such as the quantum computer, which will allow quicker calculations than today's computers that use classical mechanics. The Semiconductor Quantum Optics Laboratory at the WVU Physics Department focuses on quantum dots (QDs), a promising component of QIS. In order to better analyze QDs and the light they emit, we need a device to measure the energy spectrum of the QD and to determine its coherence time. To this end, we have designed a Fabry-Perot interferometer which will scan over a broad range of wavelengths to find these properties before the light enters a spectrometer. The Fabry-Perot interferometer is an apparatus that has two parallel mirrors with an adjustable distance between them. This allows only specific wavelengths of light to exit before examination of the QDs' properties. We will evaluate the tunability and stability of the interferometer, including features such as temperature insensitivity.

Phys Sci & Enq Poster 4:

Synthesis of gadolinium doped ceria thin layers with applications in solid oxide fuel cells

Evan B. McIntyre, Sean D. Cronin and Ed B. Sabolsky

Mechanical Engineering Department, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26505

The current study examines how a thin layer of Gadolinium Doped Ceria (GDC) has potential as the electrolyte within solid oxide fuel cells (SOFC). SOFC's are electrochemical devices that produce electricity by oxidizing a fuel with a lot more efficiency than a coal power plant. The electrolyte within the cell allows oxygen ions to cross, which becomes more efficient with a thinner layer. In industry the current cathode of choice will react with other materials in the cell, where GDC will not. Preparation of the GDC layer begins with a glass slide that is coated with a polymer release layer. Heated to 290 degrees Celsius, the layer hardens leaving a smooth surface for spin-coating on GDC. One layer of GDC hardens to 25 nanometers thick once it is heat treated to 600 degrees Celsius. This layer will perform in a more efficient manner within solid oxide fuel cells as the electrolyte. Future research will center on transferring this layer to different materials and its ability to maintain performance over time.

Physical Sciences and Engineering Category

Phys Sci & Enq Poster 5:

On-site refrigeration of liquid natural gas vehicle refueling tanks

Drew Goodman, Hailin Li, Ronald Mongold, Cesar Leon and John Hailer

Department of Mechanical Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506-6070

Liquid natural gas (LNG) is the automotive industries most viable alternative fuel. LNG is a cryogenic liquid comprised essentially of methane. Because of heat transfer from the surrounding atmosphere, resulting in tank temperature and pressure increase, storage of LNG is difficult. Current practice to control tank pressure is to vent natural gas into the atmosphere. This research focused on the design of a theoretical on-site LNG refrigeration method for pressure control. This method vents LNG vapor from a release valve to a compressor, then condenses the superheated LNG with liquid nitrogen by a heat exchanger, and the resulting saturated liquid state LNG is then throttled back into the vehicle refueling tank. While in synchronization with the LNG cycle the liquid nitrogen also undergoes a compression, condensation, expansion, and evaporation while condensing the LNG. By maximizing the storage ability of LNG, this on-site LNG refrigeration method can be economically beneficial. Furthermore, because this method does not vent LNG to the atmosphere, on-site LNG refrigeration is environmentally more advantageous than LNG venting.

Phys Sci & Enq Poster 6:

Analyzing solar storms from MENA on the IMAGE satellite

Tessa Maynard and Amy Keesee

Department of Physics, West Virginia University, Morgantown, WV 26506-6315

The Imager for Magnetopause-to-Aurora Global Exploration(IMAGE) satellite was launched in the Earth's magnetosphere in 2000 with the Medium Energy Neutral Atom (MENA) instrument attached. MENA is a slit-analyzing device that looks at neutral atoms and ions, and then calculates their velocities, incident angles, and temperatures as they pass through the magnetosphere. By doing such, images can be produced with spatial and temporal resolution. The data and images collected by MENA during geomagnetic storms are being analyzed. The data analysis will result in in graphs mapping the ion temperature in relation to time and position. Geomagnetic storms can be powerful and dangerous, knocking out power grids and satellites. Looking at the storm data will give us a better understanding of the dynamic relationship between the Earth's magnetosphere and the geomagnetic storms. Other scientists will benefit from this research as they can be better informed of the space weather conditions and type the of endurance and protection sophisticated technologies need when they must deal with the heavy bombardment of particles emitted from the sun.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 7:

Synthesis and characterization of macrocyclic metal complexes containing Lewis-acidic organoboronic ester moieties

Trevor Butcher, Vaishali Vajpayee, and Brian V. Popp

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

Metal complexes and organoboranes containing multiple Lewis-acidic centers have potential applications to various fields of chemistry, ranging from quantitative anion sensing to small molecule activation. Recent scientific literature suggests that the addition of cationic groups and electron-withdrawing moieties to these compounds enhances their binding ability, thus optimizing their properties for the aforementioned applications. In line with these observations, we have synthesized several novel macrocyclic ligands containing both Lewis-acidic boron centers and Lewis-basic diketimine and 2,6-diiminyl-pyrdine groups via a one-pot condensation process. These ligands have been characterized by various analytical techniques, including nuclear magnetic resonance (NMR) spectroscopy and electrospray ionization (ESI) mass spectroscopy. The ability of the resulting copper, iron, cobalt, nickel, ruthenium, palladium, and platinum complexes to activate molecular oxygen (via the possible formation of a superoxo or peroxo complex intermediate) and sense anions in solution, such as fluoride and cyanide, is being measured by UV-Vis titration and fluorophotometric analysis.

Phys Sci & Eng Poster 8:

Autonomous, optics-only navigation performance in lunar orbit

Andrew J. Liounis[1], Shawn Daniel[2] and John A. Christian[1]

[1]Department of Mechanical and Aerospace Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, West Virginia, 26506 and [2]North Carolina State University, Raleigh, North Carolina, 27695

The continued development of NASA's new crewed vehicle, Orion, has created a need for further examination of the ability of a spacecraft to autonomously determine its location with respect to a central body using only optical line-of-sight measurements. In response to this need, linear covariance analysis is performed for a spacecraft in various orbits about the moon in order to determine the steady state navigation performance of optics-only navigation. Optics-only navigation occurs when a spacecraft only updates the knowledge of its state through the use of a camera. To perform the analysis of the optical navigation, a model of the surface features of the moon has been developed. This model, along with the propagation of the state of the spacecraft, is used to simulate measurements. An Extended Kalman Filter has been designed to update the covariance of the spacecraft through the use of these measurements. The simulation is run until steady state performance is reached, and the results are presented as graphical design tools demonstrating the capability of an optics-based navigation scheme.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 9:

Exploring New Methods of Trifluoromethylation to Benefit Pharmaceutical and Agrochemical Consumers

Alexandria Mullins, Zachary Claudio and Jessica Hoover

Department of Chemistry, West Virginia University, Morgantown, WV 26505

The installation of a trifluoromethyl group onto an arene is useful in the pharmaceutical and agrochemical industries because it changes the physical properties of the active ingredient, typically comprised of an arene, making it more easily absorbed in the body and increasing reactivity. The current sources of the trifluoromethyl group are very expensive, so exploring the use of trifluoroacetic acid as a source is beneficial because it could potentially lower costs for consumers. Additionally, this is an atom-economical reaction, with water and carbon dioxide as the byproducts. The general goal is to develop a copper-containing catalyst that will install the trifluoromethyl group from trifluoroacetic acid onto an arene. The focus of this summer has been to synthesize an (NN) copper trifluoroacetate (NN =phenanthroline or neocuproine), and enable its decarboxylation to produce the desired copper trifluoromethyl complex. The NMR data that we have collected indicate that decarboxylation has been achieved.

Phys Sci & Eng Poster 10:

Analysis of corticospinal compensation of intersegmental dynamics in a virtual environment

Dillon Huffman[1], William Talkington[2], Bradley Pollard[2] and Valeriya Gritsenko[2]

[1]WVU Center for Neuroscience and [2]Department of Human Performance, Division of Physical Therapy, West Virginia University, Morgantown, WV 26506

While moving an appendage through three-dimensional space, the human brain has the inherent ability to compensate for the various torques that occur as a result of movement. However, in some instances, it is possible for an individual to lose the ability to compensate for these forces as the result of neurological damage such as a stroke. In our study, we hope to further understand the mechanism by which the human nervous system predicts and corrects for these forces, which could lead to useful rehabilitation strategies for individuals with impaired motor abilities. By interfacing a number of hardware and software products, we have devised a system that allows us to track motion, capture muscle activity, and observe the effects of Transcranial Magnetic Stimulation (TMS) of the M1 (primary motor cortex). By observing the change in reaction to TMS, we were able to observe the correlation between activation of the corticospinal tract and the passive interaction torques, which allows us to observe how these compensations occur.

Physical Sciences and Engineering Category

Phys Sci & Enq Poster 11:

Direct carbon fuel cells and the effects of anodes and catalysts

Christopher Gates[1], Matt Tacker[1], Andrew Radcliffe[1] and John Zondlo[1]

[1]*Chemical Engineering Department, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26505*

Direct Carbon Fuel Cells are being explored as an emerging alternative to ebb ever growing worldwide energy needs. The electrochemical reactions involving biofuels such as poplar, hardwood, corn stover, and various treatments of switchgrass to allow for both cleaner and more efficient energy than through sequestration. The cells are in planar configuration with a yttrium stabilized zirconia disc shaped electrolyte that supports multilayer cathodes and anodes. The cells are operated from 650°C to 800°C with fuel containing a biomass and a eutectic mixture of lithium and potassium carbonates applied to the anode. Open circuit voltage, varying current, impedance spectroscopy, and constant load tests are used to evaluate the cells. Since Fabrication of the cells is being undertaken in-house, they are being made with thick electrolytes to allow for more adaptive testing. This will lower efficieincy by slowing oxide ion diffusion, but give added strength. Once baseline performance has been established, examination of catalysts in the fuel, anodic structures, and different inert gasses in an attempt to increase efficiency will be reported.

Phys Sci & Enq Poster 12:

Creation of a galactic millisecond pulsar database

Natasha L. McMann and Duncan R. Lorimer

Department of Physics, White Hall, Box 6315, West Virginia University, Morgantown, WV 26506

There are over 200 known Galactic millisecond pulsars which are defined in this study as pulsars with spin periods < 30ms. They are thought to originate from low-mass X-ray binary systems. This study involved the collection of profiles of millisecond pulsars found in the Milky Way galaxy whose pulse period ranges between 1.4 and 30 milliseconds. We used a variety of resources to obtain the needed data of these pulsars. Once obtained, we created pulse profiles of each pulsar. Using the pulse profiles, we then used a computer program to fit Gaussian curves to the profile applying components with different widths, heights, and centers. The result of this study will be the creation of an online database of Galactic millisecond pulsars which will include graphs of the pulse profile of each pulsar and a text table of the components used to fit the profile. Millisecond pulsars are being used to form a Galactic-scale observatory to search for gravitational waves.

Physical Sciences and Engineering Category

Phys Sci & Enq Poster 13:

Fluorescence and gelation properties of cyanostilbene derivatives

Nathan K. Mickinac, Yao Ma and Shimei Jiang

State Key Laboratory of Supramolecular Structure and Materials, Jilin University

Molecules containing cyanostilbene have attracted interest for their variable fluorescence properties attributable to its cis-trans isomerization. Previously, the lab has synthesized a V-shaped cyanostilbene amide derivative containing a *tert*-butyl group with gelation capability in a variety of solvents. The purpose of this project was to synthesize and explore the gelation and fluorescence properties of V-shaped cyanostilbene amide derivatives containing alkoxy groups. The starting material for this synthesis, 5-hydroxyisophthalic acid, has a substitution of the hydroxyl group for an alkoxy group. The two carboxylic acids are reacted with a cyanostilbene amine to result in the desired product. The synthesis of a derivative containing a butoxy group was successful; however, exploration of alternate syntheses resulted in another molecule that has shown gelation properties in water with a minimum concentration of 4.8 mg/mL and a transition temperature of approximately 37°C. The presence of water, acetonitrile, or methanol can influence the fluorescence of the solid to emit a green, blue, or yellow color, respectively. This molecule exhibits several characteristics that require further exploration for industrial separations and sensory applications.

Phys Sci & Enq Poster 14:

Developing a platform for wireless vehicle-to-vehicle communication

Nathan D. Whitehair, S. M. Osman Gani and Yaser P. Fallah

Lane Department of Computer Science and Electrical Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University

The US Department of Transportation has expressed interest in standardizing a system by which vehicles might wirelessly communicate with each other and with the infrastructure in order to reduce vehicle collisions and traffic congestion. Frequencies around 5.9 GHz have been reserved for this purpose according to the IEEE 802.11p standard, but devices capable of communicating on these frequencies are specialized and the testing of large networks of these devices is therefore prohibitively expensive. To address this issue, we have successfully assembled a low-cost, low-power hardware platform capable of communicating on this band, currently capable of transmitting/receiving approximately 800 messages/second, simulating up to 80 devices. Our system runs a minimal open-source software package, and we have developed our own suite of software tools for testing communication patterns derived from simulation data and for serving as a framework for vehicle-to-vehicle and vehicle-to-infrastructure communications. Further work will involve continued optimization and the development of additional software services for handling other hardware devices (*e.g.*, GPS and speed sensors) and Bluetooth connectivity for a smartphone-based user interface.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 15:

Population Synthesis of Double Neutron Stars: A Journey of Partners

Craig Tenney, Duncan Lorimer and Manjari Bagchi

Department of Physics, White Hall, Box 6315, West Virginia University, Morgantown, WV 26506

Globular clusters in our galaxy provide a fertile ground for stars to undergo supernova which leads to the creation of neutron stars. A population synthesis was created to study the population of double neutron stars (DNS) in our Galaxy that originated in globular clusters. The rate of DNS formation is proportional to the cluster's luminosity and the resulting kick from the supernova at birth ejects the DNS from the cluster. Initial conditions are given to the DNS after being ejected and allowed to evolve throughout the galaxy to the present time. With a simulated population of DNS we test to see how many of them are detectable from Earth with radio telescopes. DNS are being used as a way to detect gravitation waves when the two neutron stars spiral into each other. A better constraint on their formation and existence will lead to more accurate predictions for gravitational wave detectors.

Phys Sci & Eng Poster 16:

An analysis of models of black hole – neutron star binary systems

April J. Liska[1], Duncan R. Lorimer[1], Samuel D. Bates[1], Michal Dominik[2], Kevin Stovall[3], Fredrick Jenet[4], Matthew Benacquista[4] and Chris Belczynski[2]

[1]Physics Department, West Virginia University, Morgantown, WV 26506; [2]Astronomical Observatory, University of Warsaw; [3]University of Texas-San Antonio; [4]Department of Physics and Astronomy and Center for Advanced Radio Astronomy, University of Texas at Brownsville, Brownsville, TX 78520

Bo Black hole – neutron star (BHNS) binaries are a holy grail of physics. Their discovery will provide astronomers with a new laboratory to hunt for gravitational waves. This study looked at theoretical models of BHNS binary systems and aimed to predict the number of BHNS systems potentially detectible with present and future radio telescopes. Collaborators provided two models of the galactic BHNS population, a "worst-case scenario" and a "best-case scenario". We then provided each BHNS system in each model with parameters based on known distributions of period, pulse width, magnetic field strength, pulse orientation, luminosity, galactic coordinates, and spectral index. Our results show that the number of potentially detectable systems with current radio telescopes is between 0 and 100, and that the number of potentially detectable systems with planned future telescopes could reach as many as 2000. Considering that no BHNS binary systems have yet been detected, our results are consistent with observations up to the present.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 17:

The implementation of a virtual reality system for the purpose of neuroscience research

George A. Spirou[1], Gianfranco Doretto[2], Quinn Kevin Jones[2], Michael David Morehead[2], Jared Michael Blatt[2] and Tamountonye Esther Iyalla[2]

[1]Sensory Neuroscience Research Center and [2]Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26506

In neuroscience research it is often beneficial to study a 3D reconstruction of a neuron in order to inspect the effect of the spatial relations between cell structures. Therefore, a 3D rendering and virtual reality system that can handle user interaction, control both the position and appearance of the displayed cells, and do so quickly and in a manner easy to use by those with average computer experience has been designed to handle that need. The design was based off of the open source CalVR virtual reality system, to which we added code that could handle the visual data, by grouping it into Cells, and code that would change the nature of graphical user interaction, as well as adding other interaction modes. Upon completion, it was found that the group of neuroscientists and biologists surveyed, commented positively on the improvement in efficiency and utility, a sign of a successful design so far, but future improvements are already in development.

Phys Sci & Eng Poster 18:

Tools for analyzing real-world wireless networks

Wei-Ting Chang, Salvatore Talarico and Matthew C. Valenti

Lane Department of Computer Science and Electrical Engineering at West Virginia University

Mobile phones and wireless devices have become a part of everyday life around the world, and the ability to place base stations and hotspots efficiently has proposed many challenges for wireless networking companies. The Wireless Communications Research Laboratory(WCRL) at West Virginia University(WVU) has developed a new approach to simulate real-world communication systems and optimize the efficiency of the systems. The new analysis accurately accounts for the fading and interference. However, such tools are complicated and only used by WCRL for now. The tools were better packaged and documented for easier use for the public. Also, a similar simplified tool has been developed for the Wireless Networking course at WVU, but it does not account for the fading. The purpose of this research project was to add the new software, impact of fading, into the existing tool. This would give more accurate results since it is more realistic due to the fading, and will help students learn about wireless networks. Furthermore, the computational time required to analyze wireless networks is reduced by using a computer cluster

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 19:

Determining optimal methodology for studying biomolecular transformations in IMS^2 and OMS devices

Samuel A Miller, Mahdier Khakinejad and Stephen Valentine

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

The study is to find hypothetical data demonstrating the utility of a new ion mobility spectrometry (IMS) device which utilizes a gate system to distinguish the structural transformations of biomolecular ions over a large range of rates. IMS is a common separation and identification tool which works based on the differences in mobilities of ions within a buffer gas. A similar technique known as overtone mobility spectrometry (OMS) uses a gate system for which a specific field application frequency is required in order to transmit ions. As ions traverse the drift tube, the lack of stability typically results in a change of conformation, and the use of a gate with a single open time and various delay times can be used to graphically identify the change in conformation. Ion trajectory simulations were used to study the utility of both techniques. The simulation results verified that OMS and IMS^2 can be used in a complementary fashion to study structural transformations

Phys Sci & Eng Poster 20:

Biometric technology for the enhancement of rapid analysis methods for degraded DNA

Jordan A. Drew, Allyce McWhorter, Emanuela Marasco, Jeremy Dawson and Tina Moroose

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

Currently, the field of biometrics is moving from human body signatures, such as fingerprints and iris images, toward molecular signatures, such as DNA profiles produced via STR typing. Rapid DNA analysis methods produce an individual's profile using STR peaks representing the number of short tandem repeats present at certain locations within the genome. However, this process is designed for pristine samples and does not provide much judicial support in challenging cases such as mass disasters where a sample may have degraded over time, possibly due to heat or light, or contain DNA from multiple persons. Samples of gum, blood, and cigarette butts were obtained from the members of our research group. The samples were exposed to UV light for a time period ranging from 100-200 seconds, heat exposure of 37°C, 56°C, or 75°C for a time period not exceeding 24 hours, or an uncontrolled exposure to the environment. Using an algorithm designed from data collected in degradation experiments and patterns from PCR processing, we were able to recover STRs that have dropped out and enhance the DNA's signal.

Physical Sciences and Engineering Category

Phys Sci & Enq Poster 21:

Optimization of Liquid Spray Cooling in a Variable Gravity Environment

Michael Powell, Spencer Elyard, Evan Ford, Dustin Fronaphel, Stephen Itschner, Joseph West, Jacob Cordonier, Nicholas Underwood, Mohammad Rosli, Samantha Dolin, Steven Kosko & John Kuhlman

[1]Department of Mechanical and Aerospace Engineering; [2]Lane Department of Computer Science and Electrical Engineering and; [3]Industrial and Management Systems Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506-6106

The following research, submitted to NASA's Reduced Gravity Education Flight Program by the current Microgravity Research Team at West Virginia University, is an investigation to analyze spray cooling effectiveness in a variable gravity environment aboard NASA's Reduced Gravity Aircraft. After conducting and documenting background research, the team has designed an experiment to optimize spray cooling flow rates for specific cooling effectiveness, and to determine a relationship between the spray cooling flow rate and the associated heat flux rate. The proposed experiment focuses on using an atomizing nozzle to spray water droplets at various mass flow rates onto an instrumental heat source. By varying the mass flow rate and pressure of the spray liquid, the heat flux rates at the cooled surface of the heat source can be altered and then measured. The goal of this experiment is to determine an optimized relationship among several variables to increase the efficiency of the cooling method in microgravity environments such as those found in many NASA applications.

Nanosciences Category

Nanosciences Index

Nanosciences Category

Poster 16: *Co / FeF_2 / Co Tunnel Junction Growth for Exchange Bias Measurements.* **Timothy Brown**, Trent Johnson & David Lederman.

Poster 17: *All-Optical Current Injection in Be_2Se_3 by Detection of THz Emission.* **Kevin Vargas Velez**, Derek Bas, Sercain Babakiray, Trent Johnson, Pavel Borisov, David Lederman & Alan Bristow.

Poster 18: *Fabrication and characterization of indigo films used in biodegradable optoelectronic device applications.* **Guy Cordonier**, Kevin Oresick, Dimitris Korakakis & Kostas Sierros.

Poster 19: *Alzheimer's disease and aging: preliminary exploration into the effect of oxidative damage on beta-amyloid toxicity.* **Sarah Esker**, Nicole Shamitko-Klingensmith & Justin Legleiter.

Nanosciences Category

Nano Sci Poster 1:

Theoretical study of the interaction between gold surface and CysAlaAla (AlaAlaCys) peptides

Nancy D Isner, Jessica A Carr, Hong Wang and James P Lewis

Department of Chemistry, Department of Physics, West Virginia University, Morgantown, WV 26506

It has been established that gold nanoparticles present remarkable features for biosensor and biomedicine applications. Peptides, as the building blocks of proteins, have essential roles in these applications, as they can govern the biocompatibility or biofunctionality of the gold nanoparticles. In this study, we use the gold surface to mimic gold nanoparticles on a larger nanosize scale, which usually presents flat facets in certain orientations. By attaching two small peptides on the gold surface, we are focusing on the interaction between the gold surface and the small peptides. A Density Functional Theory (DFT) approach called FIREBALL is being used to investigate these interactions through computer modeling. Using DFT, we are able to determine the most energetically favored adsorption sites and orientations for the two peptides. Further, we analyzed the electronic properties of the systems. Results confirmed that for a periodic gold surface structure, optimal attachment of the peptide occurred when laying down across the surface. These results not only confirm but are consistent with previous theoretical studies of gold nanoparticles in smaller size scale.

Nano Sci Poster 2:

Catalytic Properties in Transition Metals for Emission Control

Julia Oliveto, Fabien Goulay, Talitha Selby and Ranjith Kumar

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

Because automobiles are a known source of pollution, the Environmental Protection Agency has set specific regulations to improve the output. One element that improves environmental impact in an automobile is the catalytic converter, which oxidizes products of incomplete combustion, such as carbon monoxide, into less harmful compounds. Several problems surround the catalytic converter though, including a long warm-up time and the use of expensive metal catalysts. The characterization of known transition metal catalysts, platinum and palladium, were carried out by designing an experimental setup which housed the catalyst in a fixed flow bed reactor. A known amount of carbon monoxide, oxygen, and helium were flowed over the catalyst at temperatures between 100°C and 200°C, and then studied using an HP 5890 Gas Chromatograph. The results showed that oxidation of carbon monoxide occurred at lower temperatures during the testing of the mixed platinum/palladium catalyst. More studies that test non-precious metal catalysts and the effect of specific nanoparticle size are also being formulated. This research will optimize transition metal catalysts, and help lessen the growing environmental impact.

Nanosciences Category

Nano Sci Poster 3:

Library Synthesis of Zinc Sulfide nanoparticles with photoluminescent properties

Frank N. Youmbi and Brian V. Popp

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

A library of 80 ZnS nanoparticles doped with different first-row transition metal ions were synthesized and found to possess varied photoluminescent properties. Various synthetic procedures were tested, and the optimal procedure was preparation of an aqueous solution of metal nitrate salts with an organic thiol reagent (capping agent) and sodium sulfide followed by refluxing for 4 hours. ZnS nanoparticles doped with Mn, Fe, and Ni presented the highest photoemission. 2-Mercaptopropionic acid (capping agent), among other capping agents, produced ZnS nanoparticles with the highest luminescence. XRD spectroscopy revealed a broad pattern characteristic of zinc sulfide nanoparticles >5 nm. Dynamic light scattering measurements revealed particles of over 80 nm in size, which may suggest that the particles are aggregating or that sodium nitrate and the capping agent are forming a micelle. Bi-doped, tri-doped and tetra-doped systems were also examined but their photoluminscence proved poorer than the mono-doped systems. Future work will focus on ZnS nanoparticles with interesting properties (excitation wavelength and photoluminescence) and they will be tested with photo-induced reactions to examine their potential photocatalytic activity.

Nano Sci Poster 4:

Bio-functionalized Gold Nanoparticles: Synthesis and Characterization using Solid-State NMR

Bonnie R. Newman, Terry Gullion and Ichhuk Karki

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

The use of functionalized nanomaterial, such as gold, provides opportunities in many areas such as optics, sensors, catalysis, and especially medicine. Medicinally, these structures aid in processes like gene therapy, diagnostics, and controlled drug delivery. Therefore, it is vital to characterize how molecules bond to the gold in order to effectively utilize them in applications. Chloroauric acid is reduced by sodium borohydride to produce about 10nm size gold nanoparticles (AuNPs). The reduced AuNPs are further functionalized with different biomolecules such as cysteine, asparagine, arginine, methionine, and tripeptide glutathione. Solid state NMR provides a more useful technique to determine structures than other techniques such as x-ray crystallography because it does not require crystalline samples. ^{13}C NMR showed that cysteine on gold exhibits a bilayer and covalent bond through the thiol group while methionine shows a weak physisorption. Asparagine reveals a physisorption in ^{15}N spectra. Glutathione data reveals a small shift, indicating a physisorption onto the gold. Currently, characterization of alkanethiols, such as dodecanethiol [$CH_3(CH2)_{112}SH$], on the AuNPs is underway.

Nanosciences Category

Nano Sci Poster 5:

Effect of Hg^{2+} and Na^{+} on surface-enhanced Raman spectra of 4-mercaptopyridine

Natalie Geise[1]. Guo Zhinan[2] and Bing Zhao[2]

[1]C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV; [2]State Key Laboratory for Supramolecular Structure and Materials, Jilin University, Changchun, China

Previous research used Raman spectroscopy, an analytic technique, to detect Hg^{2+} with nanoparticles. Since surface imperfections and roughness are believed to contribute to the surface enhancement effect by creating areas of increased magnetic fields, the interaction between the Hg^{2+} and the nanoparticle surface could contribute to the Raman spectra. A greater understanding of the mechanisms would allow exploitation of the enhancement factors and more applications for the technique. Our research introduced Hg^{2+} and Na^{+} to the nanoparticles before and after treatment with a Raman reporter molecule, 4-mercaptopyridine, different than the one used previously. The samples were run through a Raman spectrometer and the spectra compared. Our results showed decreases in the Raman enhancement only when the Hg^{2+} and Na^{+} were applied before the Raman reporter. The Hg^{2+} and Na^{+} decreased the Raman spectra by different amounts. The significance of these results is Hg^{2+} produces a different effect than another cation, Na^{+}, and the order of exposure to cations affects whether the Raman is decreased when MPY is the Raman reporter.

Nano Sci Poster 6:

Integrated Microfluidics to Translate Bench Top Instrumentation into Portable Methods

Justin K. Dicks, Tyler A. Davis and Lisa A. Holland

NanoSAFE Research Experience for Undergraduates, NanoSAFE

Aspergillus, or black fungus, has a high mortality rate in immunocompromised humans. Presently, diagnosis of pathogenic infection in humans based on culture methods require days. The goal of this research is to use microfluidic chips to rapidly and inexpensively assay DNA biomarkers for Aspergillus discovered by Lukomski and co-workers. To facilitate a microfluidic DNA separation a new design for the chip injection channels was created, as well as a new method of fluid delivery. Masks for the microscale channels were iteratively redesigned and used to fabricate chips using photolithography and a wet-etch technique. Once the channels had been etched into the chip, the dimensions were quantitative profiled. Based on profilometry data, successful microfluidic designs were drilled, bonded, and ported and the separation performance evaluated. Finally, a portable and automated method of fluid delivery was designed and implemented to speed device characterization with DNA samples.

Nanosciences Category

Nano Sci Poster 7:

The use of fluorescent rare earth metal nanoparticles in ATP detection

Megan P. Jewell and Letha J. Sooter

Basic Pharmaceutical Sciences Department, West Virginia University, Morgantown, WV 26506

Most sensing platforms (e.g. carbon nanotubes, gold nanoparticles) must use organic dyes as sources of fluorescence, which decay over time and lower the effectiveness of these sensors. The goal of this experiment was to use yttrium oxide doped with ytterbium and erbium as a platform for the detection of adenosine triphosphate (ATP). The sensor is assembled from a hybridized DNA strand composed of a quencher and an oligonucleotide that selectively binds to the chosen target molecule. These DNA strands which bind only to specific target molecules are called molecular recognition elements (MREs), and are created via systematic evolution of ligands by exponential enrichment (SELEX). The binding of the target to the MRE changes the conformation and produces an increase in fluorescent intensity that was recorded via a spectrofluorometer. After a 24-hour incubation period, there was a five-fold difference in intensity recorded between samples pre- and post-ATP exposure.

Nano Sci Poster 8:

Electric Field Control of Magnetism For Energy Efficient Devices

Patrick Teixeira, Jinling Zhou, Toyanath Joshi, Pavel Borisov, Trent Johnson, David Lederman, and Mikel Holcomb

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

Consumer demands and technological innovations have pushed the industry into creating compact and more advanced devices (i.e. smart phones). As these devices become smaller and smaller, they become increasingly energy inefficient; due to a small leakage of current caused by quantum tunneling. Previous research has shown that the coupling between ferromagnetic and ferroelectric layers gives the potential ability to locally control magnetism using an electric field. In order to explore *in-situ* electric field poling, a desirable electrode configuration on the surface of the sample was optimized. Several electrode configurations were deposited onto our samples and with the use of ultrafast optics and x-ray techniques, the dynamics of current carriers through our materials were investigated. A ferroelectric hysteresis loop was obtained while applying low voltages to the out of plane electrodes. Although the in-plane poling did not produce a hysteresis loop at low voltages, a similar loop can be produced using higher voltages. The results of this research reveal a promising solution to the leakage issue in compact devices.

Nanosciences Category

Nano Sci Poster 9:

Creating protein nanorings using Ni^{2+} coordination and cucurbit[8]uril interactions

Tesia L. Gregg[1], Yushi Bai[2] and Junqiu Liu[2]

[1] C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506 and [2]State Key Laboratory of Supramolecular Structure and Materials, College of Chemistry, Jilin University, 2699 Qianjin Avenue, Changchun 130012,China

In recent years attempts have been made to develop more complex enzyme scaffolds using self-assembly methods. Previous works have shown that Glutathione *S*-transferase (GST) protein dimers can be modified to coordinated with Ni^{2+} or bind via a ligand with cucurbit[8]uril (CB[8]) to form nanowires. Using genetic mutations to add a histidine tag at a carefully chosen position, proteins were designed to coordinate with the Ni^{2+} ions at an angle leading to the formation of a ring. The creation of these rings was proven using AFM and TEM imaging. To combine the GST proteins into a nanoring using CB[8], linker molecules were designed and synthesized. The GST proteins were then modified to include cysteine tags to allow for the linker molecules to be attached. Due to time constrains the linker molecules, CB[8], and proteins were unable to be combined, but will be in future experiments. This work demonstrates the successful creation of nanorings using Ni^{2+} ion coordination and the design and synthesis of linker molecules to be used with CB[8] to create nanorings.

Nano Sci Poster 10:

Functionalizing Surfaces Using Multilayer Films Containing Sliding-Ring Networks

Emma Dolan

Eugene C. Bennett Department of Chemistry, West Virginia University 26505; State Key Lab of Supramolecular Structure and Materials, Jilin University

In previous research, it has been discovered that modified β-cyclodextrin (CD)-based polyrotaxanes can be used to form a slide ring gel which possesses interlocked CDs. We constructed a multilayer film which contains supramolecular slide ring networks. A Click Chemistry reaction of the azide group on the modified βCD and alkyne on the spacer bonds the layers. To achieve this goal, βCDs modified with azide groups were first used to prepare polyrotaxanes. Then these polyrotaxanes were layer-by-layer assembled with bi-alkyne modified oligomers via the copper-catalyzed azide-alkyne cycloaddition. Slide ring gels possess characteristics from covalently linked chemical gels and noncovalently linked physical gels. These combined qualities allow CDs to pass along the polymer chain and equalize tensional forces. These characteristics of the slide ring gel allow it to possess scratch proof properties.

Nanosciences Category

Nano Sci Poster 11:

Computational automation of molecular modeling for aptamer identification

Cheyenne E. Parsley, Robyn R. Ayscue and Peter M. Gannett

School of Pharmacy, Robert C. Byrd Health Sciences Center, West Virginia University, Morgantown WV 26505-9530

Aptamers are extremely useful peptide molecules that bind to selected target molecules. Currently, the structures of aptamers are relatively unknown because of the difficult of identifying them. The traditional technique for aptamer identification is the SELEX method, which is usually a year long, ~50,000 dollar black-box process that may not produce results. To cut down on this tedious and expensive process, we have constructed an automated system to try to find possible aptamers beforehand an thus narrow the pool of possibility. The previously identified aptamers have been put into a database and structural similarities have been found. To test if molecules may be aptamers, molecules can be run through the automated system, which creates 2D and 3D models, checks for structure of the molecule (which bases are bordering other, etc.), and compares the newly created models to those that are already in the aptamer database. This process helps pharmaceutical researchers by lowering the pool of possible aptamers from ~$1x10^{15}$ to ~$1x10^{8}$.

Nano Sci Poster 12:

Does pulmonary nanomaterial exposure produce blood-borne vasoactive substances?

Shannon M. Aippersbach[1], Phoebe A. Stapleton[2], Valerie C. Minarchick[2] and Timothy R. Nurkiewicz[2]

[1]Pennsylvania State University; [2]WVU Center for Cardiovascular and Respiratory Sciences

Engineered nanomaterials are defined as anthropogenic particles ≤ 100 nanometers and are increasingly being used in industrial, clinical, and domestic applications. Nano-titanium dioxide (TiO_2) and multi-walled carbon nanotubes (MWCNT) are two commonly used nanoparticles in these regards. Studies have shown that exposure to these nanoparticles induces arteriolar dysfunction. However, the mediator between pulmonary exposure and this dysfunction is unclear. One possible route is through chemical signals in the blood. Experiments were designed to determine if arteriolar dysfunction can be induced in naive vessels by exposing them to plasma from rats previously exposed to nanoparticles. Three vasoactive chemicals were used to evaluate function: acetylcholine, phenylephrine, and spermine NONOate. Arterioles incubated with plasma from nanoparticle exposed rats displayed: attenuated endothelium-dependent dilation (acetylcholine -247% to -372% ± 122), and augmented adrenergic responsiveness (phenylephrine -62% to -50% ± 25). However, endothelium independent response was unchanged. These findings are consistent with the notion that systemic microvascular dysfunction is mediated in part through blood-borne vasoactive substances.

Nanosciences Category

Nano Sci Poster 13:

Metabolic effects of C-60 on P450 enzymes

Andrew R. Biundo, Christopher D. Bostick and Peter M. Gannett

School of Pharmacy, Robert C. Byrd Health Sciences Center, West Virginia University, Morgantown, WV 26506-9530

The use of Buckminster Fullerene (C-60) is currently under investigation as a means of transporting pharmaceutical drugs throughout the human body. The effect of C-60 on substrate binding and metabolism by P450 enzymes is pertinent as the P450 enzymes are essential in the metabolism of most pharmaceuticals. How and to what extent C-60 affects substrate binding was determined using absorbance spectroscopy (UV/Vis). It was established that C-60 does not bind to the active site of the P450 isoenzymes studied as it caused little if any change in spin-state when it was added to solutions containing CYP2C9. Also, it did not alter the binding constant (Ks) of the CYP2C9 substrate flurbiprofen within experimental error (29 vs. 20). However, C-60 was found to inhibit metabolism of flurbiprofen as it had also been shown with diclofenac. This study demonstrates that C-60 directly affects P450 mediated metabolism of drugs and that the interaction is inhibitory. The data also suggest that C-60 is not a competitive inhibitor and additional research will be necessary to determine the mechanism.

Nano Sci Poster 14:

Nano enzyme systems developing an artificial liver for modeling protein-protein interactions

Vanessa Furby[1, 2], Katherine Hickey[2], Christopher Bostick[2], Andrew Biundo[2], and Peter Gannett[2]

[1]Byrd Science Center, Shepherd University, Shepherdstown WV 25443; [2]Pharmaceutical Sciences Department of the Health Science Center, West Virginia University, Morgantown WV 26506

Determining precise drug dosages, to give patients, is a difficult problem for pharmaceutical companies. Researchers generally use solution based methods to acquire the amount of metabolite formed from cytochrome P450 mediated metabolism; but soluble P450s can aggregate – affecting the amount of metabolite formed. Our lab immobilized three major isoforms of cytochrome P450 - CYP2C9, CYP2D6, CYP3A4 - in order to reduce or eliminate P450 aggregation. These were incubated with their respective substrates, and in the presence of other soluble P450s, to determine the effect aggregation has on the amount of metabolite formed (measured by HPLC) and how these proteins bind to each other (measured by SPR). It was discovered that immobilized P450 mediated metabolism was affected by the presence of other P450s in solution due to aggregation. For example, the presence of soluble CYP3A4 tends to inhibit the metabolism of flurbiprofen mediated by CYP2C9, and the K_d of this system was 2.7 nM. These tests show the importance of using a non-aggregating system in determining the metabolism profiles for new and existing drugs.

Nanosciences Category

Nano Sci Poster 15:

Polymer Modification in Photonic Crystal Molding for Biosensor Applications

Gary Eurice[1], Chloe Snyder[2], Anand Kadiyala[2] and Jeremy Dawson[2]

[1]Department of Chemical Engineering, University of Maryland Baltimore County, Baltimore, MD, 21250; [2]Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV, 26506

Photonic crystals are fabricated nanostructures that amplify and refract light upon excitation. These crystals have been found to detect the presence of certain cellular abnormalities by labeling biological substances with a fluorescent. A key property in determining their effectiveness is the bandgap produced. This is affected by the refractive index contrast between the crystals and the surrounding air. When the crystals are fabricated on silicon this contrast is sufficient, however molding these structures in polymer is being explored as a much cheaper way to create identical sensors. Unfortunately the refractive indices of typically used molding materials, such as PDMS, are not high enough to produce a sufficient bandgap when the environmental index is similar. It was hypothesized that the refractive index could be increased by doping the PDMS with another substance, Titanium (IV) Oxide. This was tested by mixing a 20% TiO_2 batch of PDMS and measuring with an ellipsometer. It was shown that the refractive index could be increased beyond 1.3 and still be effective in molding photonic crystals with features ~300nm in size.

Nano Sci Poster 16:

Co/FeF_2/Co Tunnel Junction Growth for Exchange Bias Measurements

Timothy Brown, Trent Johnson and David Lederman

Department of Physics, West Virginia University, Morgantown, WV, 26506-6045

Underlying today's disk drive technology is an anisotropic magnetic coupling across an antiferromagnetic (AF)- ferromagnetic (FM) interface, the exchange bias. Through examination of exchange bias for simply-ordered AF material interfaces we hope to discover the underlying physical mechanism of the coupling. One such AF material is iron fluoride (FeF_2); to investigate its exchange bias properties we grew Co/FeF_2/Co trilayers. One way to examine the exchange biasing of the trilayers is by patterning into tunnel junctions, e.g., columns of conductor/ insulator/ conductor layers surrounded by insulating SiO_2. The tunneling current through the junctions is sensitive to the magnetic and electric ordering within the columns, and hence to the presence of exchange biasing. In this project we examined the feasibility of patterning the trilayers into tunnel junctions with standard photo lithography and deposition techniques. Creation of the tunnel junctions is discussed, and challenges with the process quality are reviewed. It is found that despite mild cracking in the SiO_2 layer when exposed to photo resist developer, functional tunnel junction devices may still be created.

Nanosciences Category

Nano Sci Poster 17:

All-Optical Current Injection in Be_2Se_3 by Detection of THz Emission

Kevin Vargas Velez[1,2], Derek Bas[1], Sercain Babakiray[1], Trent Johnson[1], Pavel Borisov[1], David Lederman[1] and Alan D. Bristow[1]

[1]Department of Physic West Virginia University, Morgantown, WV; [2]Department of Physic University of Puerto Rico- Mayaguez Campus, Mayaguez, PR

Topological insulators a recently discovered material that have novel conduction properties in their surface state, exhibit a Dirac-cone density of states and spin-locking properties. These unique properties make this material very promising for future applications in spintronics. In this study, we present the control of charge carries by injecting all-optical current in Bi_2Se_3 at room temperature. Quantum interference of single-photon absorption of 2ω and two-photon absorption of ω pulses inject a polar distribution of carriers in momentum space. The acceleration of carriers is re-emitted as THz radiation that is detected by electro-optic sampling. Quantum interference from Bi_2Se_3 is dependant to the relative phase of the pump pulses. Initial results from 30nm-thick film of Bi_2Se_3 show strong emission, clean phase and power dependencies, indicating successful current injection. This demonstrates the potential for using all-optical current injection for studying the carrier dynamics in topological insulators. Future plans include examining the thickness- and wavelength-dependencies to separate bulk and surface contributions by exploiting differing densities of states and selection rules. Polarization may also be employed to inject spin-polarized currents.

Nano Sci Poster 18:

Fabrication and characterization of indigo films used in biodegradable optoelectronic device applications

Guy J. Cordonier[1], Kevin M. Oresick[2], Dimitris Korakakis[2] and Kostas Sierros[1]

[1] Department of Mechanical and Aerospace Engineering and [2] Lane Department of Computer Science and Electrical Engineering, Benjamin M. Statler College of Engineering and Mineral Resources, West Virginia University, Morgantown, WV 26506-6106

The ever-increasing production of electronic devices and their decreasing service lifetimes both require the fabrication of inexpensive and biodegradable components that will replace traditional toxic materials. This action will greatly reduce the ever-increasing need to effectively manage e-waste. Indigo has shown potential as a functional layer in organic field effect transistors, ozone filter, and other optoelectronic devices. A thermal evaporator was used to deposit layers of indigo onto glass and polyethylene naphthalate substrates at a pressure of approximately $6.0x10^{-7}$ bar. The use of flexible and rigid substrates aimed at assessing the substrate effect on the final morphology of the deposited films. A film thickness range between 25 nm to 100 nm was studied. Optical transmission measurements were conducted using a spectrophotometer. In addition, the films' surface roughness and topography were investigated using atomic force microscopy. X-ray diffraction was used to investigate the morphology of the resulting films. Finally, mechanical testing of the films deposited on the plastic substrates was performed using a miniature tensile tester coupled with an optimal microscope.

Nanosciences Category

Nano Sci Poster 19:

Alzheimer's disease and aging: preliminary exploration into the effect of oxidative damage on beta-amyloid toxicity

Sarah Wilhelmine Esker, Nicole Shamitko-Klingensmith and Justin Legleiter

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

One of the hallmarks of Alzheimer's disease (AD) is the accumulation of beta-Amyloid (Aβ) peptides into aggregates that eventually form plaques within the brain, and AD can be linked to the ability of Aβ peptides to bind neuronal membranes. As aging is a risk factor for AD and oxidative damage is associated with aging, we are investigating how oxidative damage affects the ability of Aβ to bind to cellular membranes, leading to toxicity. To begin to investigate this hypothesis, thioflavin and atomic force microscopy (AFM) assays were used to determine how hydrogen peroxide altered the kinetics of formation and morphology of Aβ aggregates. The impact of exposure to hydrogen peroxide on lipid membranes was also investigated using AFM. Spectroscopic lipid binding assays were used to determine how exposure to hydrogen peroxide altered the ability of Aβ to bind lipids. Preliminary results from spectroscopic analysis showed no significant difference in Aβ aggregation kinetics or resulting damage to lipid membranes, but AFM results did show hydrogen peroxide changes membrane structure.