2011

2011 Symposium Brochure

WVNANO SURE/REU/IRES, WVU HONORS SURE, BIOLOGY REU, SURI

Summer Undergraduate Research Symposium

Thursday, July 28, 2011
Erickson Alumni Center
West Virginia University
Morgantown, WV

wvnano.wvu.edu - www.as.wvu.edu/biology
www.honors.wvu.edu - www.hsc.wvu.edu/wvucn

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

Summer Undergraduate Research Symposium 2011
West Virginia University

Thursday July 28, 2011
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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. Keith Garbutt, Dean of the Honors College*
- *Opening remarks: Dr. Diandra Leslie-Pelecky, WVNano Director*
- *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. Tiebreaker for poster judging will be 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 (WVNano REU/SURE participants)*

II. Poster Judges

Judge	Affiliation	Category Judging
Dale Porter	Physiology, NIOSH	*Biological & Health Sciences*
Andrew Cockburn	Microbiology, Immunology, & Cell Biology, WVU	*Biological & Health Sciences*
Ken Blemings	Animal Science, WVU	*Agricultural & Environmental Sci.*
Vagner Benedito	Plant & Soil Science, WVU	*Agricultural & Environmental Sci.*
Brian Popp	Chemistry, WVU	*Physical Sciences & Engineering*
Robin Hissam	Chemical Engineering, WVU	*Physical Sciences & Engineering*
David Klinke	Chemical Engineering, WVU	*Nanosciences*
Aniketa Shinde	Education & Outreach Coordinator, WVNano	*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!

III. Undergraduate Participants and Faculty Research Mentors

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

Participant	Poster	Major	Home School	Faculty Advisor
Stephanie Ash	Nanosci #14	Physics	Ohio Northern U.	Nick Wu, ME & AE
Seth Burkert	Phys Sci & Eng #21	Chemistry	St. Francis U.	Lloyd Carroll, Chemistry
Cassandra Crihfield	Nanosci #3	Chemistry	Wheeling Jesuit U.	Lisa Holland, Chemistry
Erin Gallagher	Phys Sci & Eng #6	Chemistry	Emory & Henry C.	Yuxin Liu, CS & EE
Daniel Marshall	Nanosci #1	Physics	Penn State U.	David Lederman, Physics
Brad Nakamura	Bio & Health Sci #5	Chemistry	Xavier College	Peter Gannett, Pharmacy
Bradley Potteiger	Nanosci #2	Comp. Eng.	U. of MD, Balt. Co.	Jeremy Dawson, CS & EE
Timothy Potteiger	Phys Sci & Eng #23	Comp. Eng.	U. of MD, Balt. Co.	Andrew Cao, CS & EE
August Powers	Phys Sci & Eng #8	Chemistry	Thomas More C.	Mohindar Seehra, Physics
Kathryn Smith	Phys Sci & Eng #16	Elect. Eng.	U. of NC, Charlotte	Jeremy Dawson, CS & EE
Kelley Wambaugh	Nanosci #10	Chemistry	WV Wesleyan Co.	Justin Legleiter, Chemistry

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
Tyler Davidson	Ag & Env Sci #19	Natural Res.	U. Mass Amherst	Richard Thomas, Biology
Jenny Druckrey	Ag & Env Sci #12	Biotechnology	U. Wisc. River Falls	Nicole Waterland, Hortic
Cameron Eddy	Ag & Env Sci #11	Bio. & Env. Stud.	Allegheny College	Jim Anderson, Forest Res
Amanda Emahizer	Ag & Env Sci #7	Microbiology	Univ. of Pittsburgh	Steve DiFazio, Biology
James Fellows	Ag & Env Sci #13	Bio. & Env. Stud.	Gettysburg College	Nicolas Zegre, Forest Res.
Lucas Henry	Ag & Env Sci #16	Biology	Bard College	R. Rio & O. Zhaxybayeva, Biology
Kirsten Maier	Bio & Health Sci #14	Bio. & Env. Stud.	St. Olaf College	Bill Peterjohn, Biology
Brandon Novick	Ag & Env Sci #10	Geography	Illinois St. Univ.	Amy Hessl, Geography
Sarah Robinson	Ag & Env Sci #22	Biology & Psych.	West Virginia U.	Daniel Panaccione, Plant & Soil Sci.
Matt. Schluneker	Ag & Env Sci #17	Geography	U. of Cincinnati	Brenden McNeil, Geogr.
Katherine Sessions	Ag & Env Sci #14	Biology	Rochester Inst. Tech.	Todd Petty, Forest Res.
Mary Sweet	Ag & Env Sci #18	Biology & Span.	C. of St. Benedict, MN	Jennifer Hawkins, Bio.

C. WVNano Summer Undergraduate Research Experiences (SURE) Site (Coordinator/Director: Michelle Richards-Babb; Assistant to Director: Ted Langan)

Participant	Poster	Major	Home School	Faculty Advisor
Benjamin Bearce	Nanosci #19	Elect. Eng.	West Virginia U.	Dimitris Korakakis, CS & EE
Laura Casto	Ag & Env Sci #3	Math & Chem	WV Wesleyan C.	Lisa Holland, Chemistry
Joe Douglas	Phys Sci & Eng #10	Biology	Bethany College	Yuxin Liu, CS & EE
Michael Ebbert	Nanosci #12	Biology	West Virginia U.	Bingyun Li, Orthopedics
Nicholas Horvath	Phys Sci & Eng #18	CE & Physics	West Virginia U.	David Lederman, Physics
Kailey Imlay	Bio & Health Sci #13	Biology	West Virginia U.	Letha Sooter, Pharmacy
Anya Leach	Phys Sci & Eng #2	Physics	West Virginia U.	Mohindar Seehra, Physics
Jessica Lear	Bio & Health Sci #11	Biology	West Virginia U.	Rajesh Naz, Obstetrics & Gynecology
Kelly Lyons	Bio & Health Sci #1	Biology	Shepherd U.	Peter Gannett, Pharmacy
Surya Mavivannan	Nanosci #15	Chem. Eng.	West Virginia U.	Cerasela Dinu, Chem. Eng.
Steven McHenry	Nanosci #16	Biology	West Virginia U.	Lloyd Carroll, Chemistry
Jason Miles	Phys Sci & Eng #11	Chem. Eng.	West Virginia U.	Charter Stinespring, CE
Dilip Nagisetty	Nanosci #5	Chemistry	West Virginia U.	Kung Wang, Chemistry
James Pierce	Phys Sci & Eng #12	Physics & Math	West Virginia U.	Alan Bristow, Physics
Sripadh Sharma	Bio & Health Sci #22	Chem. & Bio.	West Virginia U.	Michael Shi, Chemistry
Clinton Smith	Phys Sci & Eng #3	ME & AE	West Virginia U.	Xueyan Song, ME & AE
Charles Umbaugh	Nanosci #18	Biochemistry	West Virginia U.	Justin Legleiter, Chemistry
David Weichsel	Phys Sci & Eng #5	ME & AE	West Virginia U.	Nick Wu, ME & AE
Jonathan Yancey	Nanosci #9	Chem. Eng.	West Virginia U.	Ed Sabolsky, ME & AE

D. Participants Supported by Faculty Research Advisors (Daneesh Simien and David Klinke)

Participant	Poster	Major	Home School	Faculty Advisor
Mona Sivaneri	Nanosci #13	Forensics	West Virginia U.	Daneesh Simien, ME & AE
Nathan Mickinac	Phys Sci & Eng #19	Chem. Eng.	West Virginia U.	David Klinke, Chem. Eng.
Shannon Gribbons	Phys Sci & Eng #22	Chem. Eng.	West Virginia U.	David Klinke, Chem. Eng.

E. International Research Experience for Students (IRES) at Jilin University in China (PIs: James Lewis and Michael Shi (IRES CAREER Award funding); IRES Coordinator: Hong Wang)

Participant	Poster	Major	Home School	Faculty Advisor
Brooke Bertus	Nanosci #20	Biology	West Virginia U.	Hao Zhang, Jilin University
Jennifer Gore	Nanosci #7	Engineering	West Virginia U.	Nan Lu, Jilin University
Meghan Hatfield	Bio & Health Sci #15	Bio & Chinese St.	West Virginia U.	Yuqing Wu, Jilin University
Lisa Liang	Nanosci #11	Biomed. Eng.	U. of Michigan	Weiqing Xu, Jilin University
Cody White	Nanosci #4	Civil & Min. Eng.	West Virginia U.	Bai Yang, Jilin University
James Jirak	Nanosci #8	Chem. & German	West Virginia U.	Shimei Jiang, Jilin University
Arnold Kidd	Phys Sci & Eng #1	Comp. Chem.	Concord U.	Wenjing Tian, Jilin University
Eamonn Maher	Nanosci #6	Chemistry	West Virginia U.	Lixin Wu, Jilin University
Ian Thistlethwaite	Nanosci #21	Chemistry	West Virginia U.	Junqiu Liu, Jilin University
Scott Tull	Nanosci #17	Comp. Chem.	Concord U.	Quan Lin, Jilin University

F. WVU Honors Summer Undergraduate Research Experiences (SURE) Site (PI: Keith Garbutt; SURE Instructor: Marie Leichliter; SURE Teaching Assistant: Chelsea Richmond, Annie Williams, and Ian Murray)

Participant	Poster	Major	Home School	Faculty Advisor
Elise Austin	Ag & Env Sci #1	Environmental Geoscience	West Virginia U.	Mike Strager, Res. Manag. & Nat. Res.
Loren Bane	Ag & Env Sci #15	App. & Env. Microbiology	West Virginia U.	Kristen Matak, Aquaculture
Diana Black	Ag & Env Sci #20	Biology	West Virginia U.	Jennifer Hawkins, Biology
Erica Fitzsimmons	Ag & Env Sci #6	Biology	West Virginia U.	E. Pena-Yewtukhiw, Plant & Soil Sci.
Frank Hamilton	Phys Sci & Eng #7	CS & EE	West Virginia U.	Powsiri Klinkachorn, CS & EE
Bryce Hartman	Ag & Env Sci #9	Biology	West Virginia U.	Stephen DiFazio, Biology
Kenneth Hite	Phys Sci & Eng #15	Elect. Eng.	West Virginia U.	Dimitris Korakakis, CS & EE
Jordan Holliday	Ag & Env Sci #2	Chem. Eng.	West Virginia U.	Kaush. Singh, Foresty & Nat. Res.
Adam Knecht	Bio & Health Sci #2	Biochemistry	West Virginia U.	Chad Paton, Animal & Nutr. Sci.
Mark Lemons	Ag & Env Sci #5	Animal & Nutr. Science	West Virginia U.	Joe Moritz, Animal & Vet. Sci.
Andrew Licata	Bio & Health Sci #3	Biology	West Virginia U.	Jim Belanger, Biology
Michael Lynch	Nanosci #22	Chemistry	West Virginia U.	Justin Legleiter, Chemistry
Matthew Merrill	Ag & Env Sci #4	Enironmental Geoscience	West Virginia U.	Amy Hessl, Geography/Geology
Nainika Nanda	Ag & Env Sci #21	Biochemistry	West Virginia U.	Janet Tou, Animal Science
Bhumika Parikh	Bio & Health Sci #6	Biology	West Virginia U.	Kevin Daly, Biology
Joshua Rairigh	Bio & Health Sci #12	Psychology	West Virginia U.	Miranda Reed, Psychology
Harry Shaffer	Phys Sci & Eng #9	ME & AE	West Virginia U.	John Kuhlman, ME & AE
Grant Shulman	Bio & Health Sci #9	Psychology	West Virginia U.	Daniel McNeil, Psychology
Jacob Steele	Phys Sci & Eng #13	CS & CE	West Virginia U.	Afzel Noore, CS & EE
Nathan Tehrani	Phys Sci & Eng #20	Physics & Math	West Virginia U.	Duncan Lorimer, Physics
Abigail Thaxton	Bio & Health Sci #4	Nutrition	Ohio University	Melissa Olfert, Human Nut. & Foods
Chris. Thompson	Phys Sci & Eng #4	Chem. Eng.	West Virginia U.	Cerasela Dinu, Chem. Eng.
Alixandra Wagner	Ag & Env Sci #8	Biology	West Virginia U.	Jim McGraw, Biology
Keith Weise	Phys Sci & Eng #17	Biochemistry	West Virginia U.	Michael Shi, Chemistry
Joseph Yaworski	Phys Sci & Eng #14	CS & Biometric Systems	West Virginia U.	Bojan Cukic, CS & EE

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

Participant	Poster	Major	Home School	Faculty Advisor
Rebekah Duke	Bio & Health Sci #18	Psychology	Virginia Tech	Hanting Zhang, Behav. Med./Psych.
Joel Eisenhofer	Bio & Health Sci #10	Neuroscience	Davidson College	Albert Berrebi, Otolaryngology
Susannah Engdahl	Bio & Health Sci #20	Physics	Wittenberg University	James W. Lewis, Physiology
Yunxi (Emily) Fan	Bio & Health Sci #8	Neuroscience	Amherst University	Eric Tucker, Anatomy
Sheila Gokul	Bio & Health Sci #21	Neuroscience	Trinity University	Julie Brefczynski-Lewis, Physiology
Elizabeth Kline	Bio & Health Sci #7	Neuroscience, Hist. & Phil. of Science	Pittsburgh University	Miranda Reed, Psychology
Nikolai Radzinski	Bio & Health Sci #17	Biochemistry & Molec. Biology	Wooster College	Valeriya Gritsenko, Human Perf.
Reema Upadhyaya	Bio & Health Sci #19	Neuroscience & Behavior	Mt. Holyoke College	George Spirou, Otolaryngology
Melanie Zhang	Bio & Health Sci #16	Neuroscience & Behav. Biology	Emory University	Jason Huber, Pharmacy

IV. Speakers at REU/SURE Events

Speaker	Affiliation	Group(s)	Topic
David Lederman	Dept. of Physics, WVU	WVNano REU	Basis Aspects Nanosci./Eng.
Barbara Foster	Dept. of Chemistry, WVU	WVNano REU & SURE	Laboratory Safety
Aniketa Shinde	WVNano, Educ. & Outreach Coordinator	WVNano REU & SURE	Nanoscale Characterization, Nanofabrication Methods, Nanoscience Outreach
Michelle Richards-Babb	Dept. of Chemistry, WVU	WVNano REU WVNano REU & SURE REU & SURE	Oral Present. Skills/Lab Notebks, Scientific Ethics, and Effective Poster Presentations
Linda Blake	Wise Library, WVU	WVNano REU & SURE	Scientific Search Tools
Kolin Brown	WVNano Shared Fac., WVU	WVNano REU & SURE	Cleanroom Training & Chemical Safety
Martin Pumera	Academician: Asst. Prof., Nanyung Tech. U.	WVNano REU & SURE	Career Mentoring & Research
Amy Cyphert	Honors College WVU	Honors/WVNano SURE	ASPIRE program & Scholarships
Christopher Dacko	Industry: Res. Scientist PP&G Industries	WVNano REU & SURE	Career Mentoring & Industry
Katie Stores	Grants Management Spec., WVU	Honors SURE	Grant Writing Workshop
Earl Scime, Cerasale Zoica-Dinu, Mohammed Choudhry, Harry Finklea, Jonathan Cumming, Jason Huber, Donald Adjeroh	Graduate Coordinators: WVU	WVNano/Biology REU & Honors/WVNano SURE	Graduate School Roundtable,
Daniel Stover	Government: Dept. of Energy	WVNano/Biology REU & Honors/WVNano SURE	Career Mentoring & Government Work

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?
WVNano: http://wvnano.wvu.edu/index.html
WVNano REU: http://wvnano.wvu.edu/ugr/reu/wvnREUMain.html
WVNano SURE/IRES: http://wvnano.wvu.edu/SURE/
Biology REU: http://reu.as.wvu.edu
WVU Honors administered SURE: www.honors.wvu.edu/sure
WVU Center for Neuroscience SURI: http://www.hsc.wvu.edu/wvucn/SummerInternships-(SURI)

VI. Acknowledgements

A. Personnel

WVNano REU
Michelle Richards-Babb, PI
David Lederman, co-PI
Aniketa Shinde, WVNano Educ./Outr. Coord.
Ted Langan, Asst. to REU Director

WVNano SURE
Michelle Richards-Babb, Director/Educ. Coord.
Aniketa Shinde, WVNano Educ./Outr. Coord.
Ted Langan, Asst. to SURE Director
Lisa Sharpe, Budgeting & Financial Assist.
Martha White, Support

Biology REU
Richard Thomas, PI
Kenny Smith, Graduate guide/mentor

IRES/CAREER
Michael Shi, PI.
Hong Wang, IRES Coordinator

IRES
James Lewis, PI
Boyd Edwards, co-PI
Pete Gannett, co-PI
David Lederman, co-PI
Michael Shi, co-PI
Hong Wang, IRES Coordinator

WVU Honors administered SURE
Keith Garbutt, PI
Marie Leichliter, SURE Instructor
Chelsea Richmond, SURE Teaching Asst.
Annie Williams, SURE Teaching Asst.
Ian Murray, SURE Teaching Asst.

SURI
George A Spirou, Director
Erica Stewart, Coordinator

Symposium Booklet
Michelle Richards-Babb
Ted Langan
Aniketa Shinde

Symposium Planning

Chelsea Richmond	Christie Zachary
Annie Williams	Michelle Richards-Babb
Keith Garbutt	Aniketa Shinde
Ian Murray	Ted Langan

B. Financial Support

1. **WVNano REU (PI: Michelle Richards-Babb, co-PI: David Lederman)**
National Science Foundation (NSF) Divisions of Materials Research and Chemistry (DMR-1004431) 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-0849917) and in part by the WVU Department of Biology, WVU Eberly College of Arts and Sciences, and WVU Office of Provost.

3. **WVNano SURE**
Sponsored by the NSF WVEPSCoR program and a Research Infrastructure and Improvement (RII) grant.

4. **IRES (PI: James Lewis, co-PIs: B. Edwards, D. Lederman, P. Gannett, and M. Shi)**
Sponsored in part by the National Science Foundation OISE IRES/DDEP-0824860, NSF WVEPSCoR program/RII grant, and the WVU Eberly College of Arts and Sciences.

5. **IRES/CAREER (PI: Michael Shi)**
Sponsored in part by the National Science Foundation CAREER ??, NSF WVEPSCoR program/RII grant, and the WVU Eberly College of Arts and Sciences.

6. **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.

7. **WVU Center for Neuroscience SURI (Director: George A. Spirou, Program Coordinator: Erica Stewart)**
Funded by the Center for Neuroscience and the NIH/NCRR COBRE Grant P30 RR031155.

8. **Research Symposium Monetary Prizes**
Sponsored by the NSF WVEPSCoR program and a Research Infrastructure and Improvement (RII) grant.

Biological and Health Sciences Category

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Poster 8: *Role of Map3k12 binding inhibitory protein in cortical interneuron migration.* Yunxi E. Fan, Abigail K. Myers, Eric S. Tucker

Poster 9: *Gagging during dental treatment: Epidemiology and relation to dental fear.* Grant P. Shulman, Cameron L. Randall, and Daniel W. McNeil

Poster 10: *Morphological and electrophysiological characterization of superior paraolivary nucleus (SPON) neurons.* Joel D. Eisenhofer, Richard A. Felix, and Albert S. Berrebi

Poster 11: *Nanotechnology for novel contraceptive development incorporating curcumin-albumin conjugates.* Jessica J. Lear and Rajesh K. Naz

Poster 12: *An assessment of response acquisition by FVB and 129S6 mice using an autoshaping training procedure.* Joshua R. Rairigh, Elizabeth M. Kline, Lunden L. Ryan, and Miranda N. Reed

Poster 13: *In vitro selection of molecular recognition elements against exotoxin A.* Kailey Imlay, Ryan M. Williams, Letha J. Sooter

Poster 14: *The effects of nitrogen deposition on soil respiration on temperate deciduous forests in central appalachia.* Kirsten Maier, Zach Fowler and William Peterjohn

Poster 15: *Controlled self-assembly of human papillomavirus virus-like particles.* Meghan Hatfield, Yuqing Wu, and Shi Jin

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Biological and Health Sciences Category

Poster 17: *Kinect as a tool for collecting kinematic data for physical therapy.* Nikolai Radzinski, Paula Webster, Sergiy Yakovenko, Valeriya Gritsenko

Poster 18: *Inhibition of PDE10 decreases alcohol consumption in mice.* Rebekah Duke, You-Ming Jiang, Han-Ting Zhang

Poster 19: *Gene expression during synaptogenesis in early brain development.* Reema Upadhyaya, Marlin Dehoff, Doug Kolson, and George A. Spirou

Poster 20: *Processing advantages for conspecific vocalizations in human auditory cortex.* Susannah M. Engdahl, William J. Talkington, Christopher A. Frum, James W. Lewis

Poster 21: *Effects of compassion meditation on stress in response to liked and disliked faces.* Sheila R. Gokul, Tadashi Kato, Diane B. Miller, and Julie A. Brefczynski-Lewis

Poster 22: *Innovative synthesis of two chiral-centered 1,2-diols via hydrolysis by organogold catalysis.* Sripadh B. Sharma, Dawei Wang, and Xiaodong Shi

Biological and Health Sciences Category

Bio & Health Sci Poster 1:

Interactions between the β-domain of ZBP1 and aryl hydrazine-modified DNA

Kelly A. Lyons[1], Nissa M. Thomsen[2], Brian C. Train[2], Suzan Bilgesu[3], Peter M. Gannett[2]
[1]Department of Biology, Shepherd University, Shepherdstown, WV 25443-5000, [2]Department of Pharmaceutical and Pharmacological Sciences, School of Pharmacy, West Virginia University, P.O. Box 9530, Morgantown, WV 26506, and [3]Department of Biology, Eberly College of Arts and Sciences, West Virginia University, P.O. Box 6057, Morgantown, WV 26506

Z-DNA is a left-handed conformation of DNA that has been shown to play a role in transcription regulation. Until now, the relevant literature concerning Z-DNA binding proteins (ZBPs) has only considered their effects on unmodified DNA. Our purpose is to investigate how the β binding domain of the human Z-DNA binding protein, ZBP1, interacts with DNA modified by aryl hydrazines, known carcinogens. Our central hypothesis is that ZBP1 stabilizes the Z conformation of DNA oligonucleotides and that this effect increases as the carcinogens interact with key tyrosine residues in the binding domain of ZBP1. To test this hypothesis, we expressed the protein through E. coli. pET-28a(+) plasmid vectors and purified the protein by nickel ion chromatography. We will then study the effect of the protein on the conversion of DNA from B to Z conformation by circular dichroism spectroscopy (CD). Results are pending, but we expect that ZBP1's affinity for modified DNA will be greater than its affinity for unmodified DNA, possibly suggesting a carcinogenic mechanism for aryl hydrazine adducts.

Bio & Health Sci Poster 2:

Different sugar sweetened liquids affect lipid metabolism through an increase in lipogenesis

Adam Knecht, Vagner Benedito, Chad Paton and Janet Tou
Division of Animal and Nutritional Sciences, Davis College of Agriculture, West Virginia University, Morgantown, WV 26506

America has been faced with a new problem as obesity rates continue to rise in people of all ages which correlate with an increased consumption of sweetened foods and drinks. This study was designed to determine if some of the popular sweeteners added to food and drinks lead to the generation of new fatty acids through lipogenesis. Female Sprague-Dawley rats were randomly chosen to drink either water or water sweetened with glucose, fructose, sucrose, or high fructose corn syrup-55. After 8 weeks the rats were dissected and different measurements were taken from the liver, the main organ involved in the metabolism of fatty acids, to determine if there was an increase in lipogenesis. Stearoyl-CoA desaturase-1, sterol regulatory element-binding protein, lipoprotein lipase, and acetyl-CoA carboxylase are genes that are directly involved in lipogenesis and the expression of these genes in our liver samples was measured using real-time PCR. Not all results have been obtained yet, but there is some preliminary evidence that suggests these sweeteners do increase fatty acid production. Rats drinking the sweetened water all had higher triglyceride levels compared to water as well as fasting glucose and insulin levels with high fructose corn syrup having the highest levels in each category.

Biological and Health Sciences Category

Bio & Health Sci Poster 3:

Neuromechanical control of crustacean muscles

Andrew Licata and Jim Belanger
Eberly College of Arts and Sciences, West Virginia University, Morgantown, WV 26505

Muscle contractions are affected by both neural input and the mechanical properties of the muscle. To better understand this relationship, we examined properties of muscles in the legs of the Louisiana crayfish (*Procambarus clarkia*). Electrical and mechanical responses of the closer muscle were analyzed with respect to different electrical stimuli. With a change in the frequency of the stimulus, a maximum muscle response (electrical and mechanical) was observed at a frequency of about 15 Hz. An increase in the stimulation amplitude decreased the duration needed for a threshold response. This relationship was almost identical to an exponential function; however neither factor had any significant effect on muscle force. Using a twin pulse stimulus, a max force was observed with a 6ms delay between the pulses. This delay also corresponds to the maximum electrical response amplitude of the muscle. The relationship between the lengths of muscle fibers (closer, flexor, and extensor muscles) has been related to the angle in the corresponding joint, which resembles part of a cosine function.

Bio & Health Sci Poster 4:

Choice architecture in Appalachian high school cafeterias

Abigail Thaxton and Melissa Olfert
Davis College of Agriculture and Division of Animal and Nutritional Sciences, West Virginia University, Morgantown, WV 26506-6108

The obesity epidemic in West Virginia ranks third for rates of adult obesity and eighth among adolescents. Despite current salad bar availability, many students refuse the variety of healthier options lunch lines offer. New research deriving from behavioral economic principles is occurring to study environmental aspects of cafeterias such as layout, lighting, noise level, crowdedness, peer influence, water supply, color scheme, table size, food presentation and packaging. Behavioral economics theory is based on our knowledge about the psychology of decision-making thus translating to food choices made by high school students in cafeterias. Using a community-based participatory research model, our ongoing research will investigate such “choice architectural” characteristics of five high schools in three counties of West Virginia during the 2011-2012 school year. Findings from this observational study will assist in designing effective interventions through cafeteria architecture, ultimately resulting in students making the healthier choice.

Biological and Health Sciences Category

Bio & Health Sci Poster 5:

Studying effects of protein aggregation on drug metabolism through immobilizing on self-assembled monolayer

Bradley A. Nakamura, Katherine M. Hickey, and Peter M. Gannett
Robert C. Byrd Health Sciences Center, Department of Basic Pharmaceutical Sciences, West Virginia University, Morgantown, WV 26506-9530

Cytochrome p450s are responsible for approximately 75% of drug metabolism. Drugs are screened with these enzymes in clinical trials to see how they will interact with the enzymes in order to determine therapeutic doses and whether a metabolite could cause unfavorable interactions. These trials take place with all components in solution where proteins can aggregate freely rather than bound on a membrane as in the liver. This suggests that clinical trials may be incorrect evaluations of drug metabolism. To evaluate the effect this aggregation has on enzyme function, cytochrome p450 2d6 or 2C9 was bound to a self-assembled monolayer attached to a 50nm of gold bound to a silicon chip. A suitable drug was placed with the chip and metabolite formation was measured with high performance liquid chromatography. The amount was compared to traditional solution tests and vials containing both the immobilized and free enzyme. A greater amount of metabolite was found in solution trials. Trials containing both free and immobilized enzyme suggest that aggregation plays a significant but as of yet unpredictable role in metabolism.

Bio & Health Sci Poster 6:

Effects of enriching environment on adult neurogenesis in tobacco hornworm, Manduca Sexta

Bhumika H. Parikh, Sarah M. Farris, & Kevin C. Daly
Eberly College of Arts and Sciences Department of Biology, West Virginia University, Morgantown, WV 26506

Adult neurogenesis, birth of neurons, is one of many mechanisms responsible for brain's plasticity during adulthood, allowing increase in organisms' adaptability to their varying environment. Though most neurogenesis was thought to take place during development, further research proved its lifelong function in learning and memory areas of most animal species including mushroom bodies some insects such as the tobacco hornworm, Manduca sexta, used in this experiment. Exposure to rich environment settings resulted in increased number of neurons within mushroom bodies of organisms such as crickets compared to those in impoverished environment. In this experiment, the effect of an enriching environment on the adult moth on neurogenesis was tested through sensory stimulation by presenting different odors to it and environmental stimulation by providing food sources and social interaction with other moths. M. sexta was injected with BrdU, a thymidine analog, and immunocytochemical detection of it was utilized to identify the new neurons formed during adulthood. Increase in rate of neurogenesis in adult M. sexta is expected with exposure to an enriched environment.

Biological and Health Sciences Category

Bio & Health Sci Poster 7:

Testing learning and memory in mice: comparing background strains

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The genetic background of mice can affect the acquisition of learning and memory tasks, a point of particular import in transgenic models of neurological diseases. This issue must be considered in experimental designs to insure efficient application of research animals and to control non-experimental variables. Ten males from an FVB strain and eight males from a 129S6 strain completed an autoshaping program. In autoshaping component 1, "free" reinforcers were delivered every 5.5 minutes with simultaneous access to an active nose-poke device, on which every response earned a reinforcer. After ten correct responses or twenty non-contingent reinforcers, mice proceeded to component 2, where only contingent reinforcement continued. The active nose-poke device was moved and mice returned to component 1 following forty reinforced nose-pokes during two consecutive 2.5 hour sessions. Strain differences and effectiveness of this training procedure will be assessed by number of reinforcers earned, time to meet acquisition criteria, and perseveration on inactive nose-poke devices. The results will shape future breeding protocols, supporting the improvement of transgenic mouse models.

Bio & Health Sci Poster 8:

Role of Map3k12 binding inhibitory protein in cortical interneuron migration

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Diseases of cortical connectivity, including schizophrenia and autism, are thought to arise during development and involve imbalanced function of cortical interneurons. Elucidating cellular and molecular mechanisms surrounding cortical interneuron development—including their birth in the medial ganglionic eminence (MGE) and migration into the cerebral cortex—are therefore vital for understanding the origin of these disorders. We recently found *Map3k12 binding inhibitory protein* (*Mbip*), a negative regulator of c-Jun N-terminal kinase (JNK) signaling, to be expressed by MGE progenitor cells. The roles of Jnk activity or Mbip function in the specification, migration, and/or differentiation of cortical interneurons have yet to be uncovered. In this study, we used a novel slice-culture assay and innovative quantification techniques to determine the impact of altering JNK activity and Mbip expression levels on the migration and early differentiation of MGE-derived cortical interneurons. These approaches are vital in determining the roles for Mbip and JNK signaling in the early development of cortical interneuron circuitry, and will ultimately provide insight into the molecular pathways of susceptibility to neurological and neuropsychiatric disease.

Biological and Health Sciences Category

Bio & Health Sci Poster 9:

Gagging during dental treatment: Epidemiology and relation to dental fear

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Gagging is a reflexive response that interferes with oral health care, and has been suggested to relate to dental fear. Little is known about the epidemiology of gagging during dental care. To explore this phenomenon, 614 participants were recruited from an emergency dental clinic at West Virginia University, and completed the Dental Fear Survey and a demographics questionnaire that included questions about problems with gagging. Over half of the participants (i.e., 57.2%) reported gagging during dental visits, with 7.3% (n = 45) frequently or almost always gagging. Also, 3.5% (n = 21) of the sample indicated that gagging frequently or almost always interrupted dental treatment. No sex or age differences were found for prevalence of gagging in the dental clinic. Interestingly, gaggers had higher dental fear (M = 59.8, SD = 22.0) than nongaggers (M = 42.1, SD = 18.2; t (612) = 6.19, p < .001). Clearly, gagging in the dental clinic is a prevalent problem that warrants further inquiry.

Bio & Health Sci Poster 10:

Morphological and electrophysiological characterization of superior paraolivary nucleus (SPON) neurons

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The superior paraolivary nucleus (SPON) neurons, situated within the brainstem's superior olive, plays an important role in responding to the offset of auditory stimuli. Whereas the electrophysiological responses of SPON neurons have been well studied, little is known about their morphological characteristics. To address this gap in knowledge, we made electrophysiological recordings and 3D reconstructions of SPON neurons from mouse brainstem slices. These data were included in a Principal Component Analysis (PCA) to reveal clusters of correlated features. PCA serves to condense a field of possibly correlated variables into a much smaller number of uncorrelated variables called "principal components" that more clearly delineate differences between groups within a population. Only one morphological cell type and two electrophysiological response types were identified. However, the small population of neurons from which data was acquired, limited the number of variables that could be included in the PCA analysis. Future work involving larger sample sizes will permit greater variable inclusion in PCA and consequently could unveil additional sub-classes of SPON neuron types.

Biological and Health Sciences Category

Bio & Health Sci Poster 11:

Nanotechnology for novel contraceptive development incorporating curcumin-albumin conjugates

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Current contraceptives increase sex along with STDs and cervical cancer. There is need for a contraceptive that allows sex while fighting STDs and cervical cancer. Curcumin, the yellow component of the spice turmeric, has been used in medicines for centuries. Previously it has been shown to be anti-inflammatory, anti-oxidant, anticancer, anti-Alzheimer, and more. The use of curcumin as a contraceptive is a novel idea that could protect against STDs and cervical cancer. Previously, the lab has shown that curcumin decreases sperm motility and fertility in mice. Now, we have linked curcumin with albumin, which increases the solubility of curcumin. Curcumin and albumin naturally bind hydrophobically, but covalently linked curcumin-albumin conjugates with stronger bonds were created. We tested the effects of curcumin, naturally bound curcumin and albumin, and curcumin-albumin conjugates on human sperm. Naturally bound curcumin and albumin took significantly less time to impede sperm forward motility than curcumin alone. Preliminary data suggests that curcumin-albumin conjugates stop sperm even faster. This suggests that curcumin-albumin conjugates could provide an ideal contraceptive.

Bio & Health Sci Poster 12:

An assessment of response acquisition by FVB and 129S6 mice using an autoshaping training procedure

Joshua R. Rairigh, Elizabeth M. Kline, Lunden L. Ryan, and Miranda N. Reed
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Performance in behavioral tasks is influenced by an animal's genetic background, making strain differences an important factor in experimental designs. The current study compares the acquisition of nose-poke responding between FVB (n=10) and 129S6 (n=8) male mice on three distinct nose-poke devices positioned on the front left, front right, and back center walls within an operant chamber. Each nose-poke device is trained separately, and a light signals the active nose-poke. The other devices are darkened and inactive. Responses on the active nose-poke device result in milk delivery, whereas responses on inactive nose-poke devices produce no effect. Sessions end after 2.5 hours or 40 nose-poke responses are emitted on the active device. Nose-poke responding is considered acquired for a particular device after two sessions of 40 responses. Dependent variables include session length, number of correct and incorrect responses made within each component, and number of reinforcers earned per session. Comparison of the dependent variables listed above will allow us to assess quantitatively the differences in nose-poke response acquisition between the FVB and 129S6 strains. We predict all mice will emit the correct nose-poke response in the presence of discriminative stimuli by the end of the training procedure, but subtle differences in the acquisition of nose-poke responding will be present.

Bio & Health Sci Poster 13:

In vitro selection of molecular recognition elements against exotoxin A

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Exotoxin A is secreted from *Pseudomonas aeruginosa* as a proenzyme that enters susceptible mammalian cells and catalyzes a reaction that blocks protein synthesis. It is thus toxic to both animals and humans. The pathogen is involved in hospital diseases and infections, common in patients with weakened immune systems. The objective of this study is to select molecular recognition elements that bind to exotoxin A with highest affinity. Specifically, two types will be selected: (1) single stranded sequences of DNA from a pool of varying sequences and (2) proteins expressed on the surface of yeast cells. Research will be conducted by completing multiple rounds of *in vitro* selection against exotoxin A. Once selected, these Molecular Recognition Elements can be used in biosensors and aid in the detection of *Pseudomonas aeruginosa*, aiming to decrease rates of infection. Results show that once the study is complete, both DNA and peptide aptamers for exotoxin A will be known.

Bio & Health Sci Poster 14:

The effects of nitrogen deposition on soil respiration on temperate deciduous forests in central appalachia

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Human fossil-fuel burning activities have led to an increase in nitrogen emissions, which often lead to higher rates of nitrogen deposition. Increased nitrogen deposition in nitrogen-limited ecosystems can lead to changes in many ecosystem characteristics including soil microbial activity. Changes in soil microbial activity lead to changes in decomposition rates, which affect the amount of carbon stored in an ecosystem. We studied the effects of increased nitrogen on soil microbial activity by studying changes in soil respiration rates. We expected soil respiration and therefore soil microbial activity to decrease with increased nitrogen inputs. Soil respiration readings were taken from two treatments in a blocked experimental design in the Fernow Experimental Forest. Both treatments were whole tree harvested and allowed to regrow, one without any added inputs and one with additions of 30 kg N/ha/yr. Soil respiration was measured 8 times over the summer. The results showed that there was no significant difference in soil respiration between the two treatments, leading to the conclusion that in the Fernow Experimental Forest and similar forests increased nitrogen levels do not affect soil respiration and therefore do not lead to increased carbon storage.

Bio & Health Sci Poster 15:

Controlled self-assembly of human papillomavirus virus-like particles

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In America, development of the HPV vaccine has helped suppress new cases of cervical cancer caused by types 16 and 18. However, this vaccine lacks protection for parts of the world where other subtypes are more prevalent. In this study, we examined HPV VLP assembly and disassembly to understand the mechanisms responsible for formation of a hybrid particle. The HPV capsid (L1) protein was collected after induced expression in E. coli and purified using size exclusion chromatography. L1 proteins assembled onto a T=7 icosohedral lattice during protein dialysis. Assembly and disassembly was tested using DLS and SLS. It was found that 16, 18, and 16/18 VLP disassembled the fastest at pH=8 and the slowest at pH=6. Assembled 16 and 18 VLP measured 52.5 nm and 57.7 nm. The 16/18 hybrid VLP measured 54.4nm. This size indicates a successful hybrid assembly, given its similarity to the individual 16 and 18 VLP. Through understanding the chemical interactions of self-assembly, it may be possible to assemble a VLP containing several cancer-causing subtypes, providing better protection against cervical cancer.

Bio & Health Sci Poster 16:

Sleep deprivation decreases locomotion activity in aged Sprague-Dawley rats

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People working irregular or asynchronous hours suffer increased incidence of cardiovascular disease. These disruptions in sleep cycles lead to changes in physical activity that has a detrimental effect on overall health. We contend these problems are worsened in older individuals who already have decreased physical activity. In this study, we examined changes in locomotor activity of aged female Sprague-Dawley rats following sleep deprivation. Rats were sleep deprived by gentle handling for 6 consecutive hours over 6 days. We hypothesized that alterations in normal sleep cycles reduce total locomotor activity in aged rats. Results showed that sleep deprived rats had a significant decrease in total activity as compared to rats on a normal sleep pattern. The largest disturbances in locomotor activity occurred after the lights turned out (at 6-8 pm) and just before the lights turn on (4-6 am). These results indicated that locomotor activity was diminished in sleep deprived aged rats and that these changes may be a result of altered circadian rhythm response, as shown by the times of the largest decreases in locomotion.

Bio & Health Sci Poster 17:

Kinect as a tool for collecting kinematic data for physical therapy

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[2]*Department of Human Performance: Physical Therapy Division, West Virginia University*

In rehabilitation movement impairment is usually assessed by observation. At the same time, current technology allows for objective quantitative measurement of movement kinematics. The purpose of our study is to test the feasibility of using Microsoft Kinect to collect limb and joint position data for clinical assessment of movement. The experiment consists of using infrared LEDs for human motion capture (Phasespace Co.) and simultaneously collecting kinematic data from the Microsoft Kinect sensor during several simple movements. The accuracy of three-dimensional data from the Kinect is then compared quantitatively to that of Phasespace. The results show that the kinematic data captured by Kinect has enough accuracy and precision to be used for motion assessment for Physical Therapy purposes, for example as part of a Fugl-Meyer Test. Kinect motion capture is not going to be of equal quality of the other, more expensive, motion capture technology. However, the low price and the acceptable level of accuracy makes it far more useful in clinics.

Bio & Health Sci Poster 18:

Inhibition of PDE10 decreases alcohol consumption in mice

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Cyclic AMP (cAMP)-protein kinase A signaling has been shown to modulate the consumption of ethanol. Phosphodiesterase-10 (PDE10) hydrolyzes cAMP and is functionally important for regulating cAMP levels in the brain. Our recent study has shown that PDE4 inhibition decreases ethanol intake in mice, but the role of PDE10 in ethanol consumption remains unknown. The objective of this study was to determine whether PDE10 was involved in regulating ethanol intake. The two-bottle choice paradigm was used to assess consumption of ethanol, sucrose, and quinine in C57BL/6J mice treated with papaverine, a PDE10 inhibitor. Papaverine was administered (i.p.) at doses of 3, 10, and 30 mg/kg; rolipram was also given (0.5 mg/kg, i.p.) as a positive control. Papaverine at the dose of 3 mg/kg decreased ethanol intake and preference. In contrast, at higher doses (10 and 30 mg/kg), papaverine had no significant effect on ethanol intake. These results suggest that inhibition of PDE10 decreases ethanol intake. PDE10 may be a target for drugs that reduce ethanol consumption.

Biological and Health Sciences Category

Bio & Health Sci Poster 19:
Gene expression during synaptogenesis in early brain development

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Our laboratory studies gene expression patterns, neural circuit formation and functional maturation of neurons in early brain development in mice. Previously, sampling of gene expression using mouse exon microarrays at daily intervals revealed eight temporal patterns of gene expression during synaptogenesis and synaptic competition in the brainstem auditory system. Two temporal patterns, a linear increase and a parabolic increase in gene expression, require validation using quantitative real-time PCR. I have designed primers for the genes Aldh1a1, Cdh20, Sema4d, and Adamts4 and will validate them in coming days. Our laboratory also studies the structural dynamics of synapse formation using novel technology called serial blockface scanning electron microscopy (SBFSEM). I have reconstructed a complete cell at postnatal day 4, contributing to a database showing that synaptic competition is resolved by this age and a single input innervates the cell body of its postsynaptic target, as in the adult brain. Quantitative analysis reveals that 25.9% of the total somatic cell surface area was contacted by this winning input. Future studies will assay roles of validated genes in synaptogenesis.

Bio & Health Sci Poster 20:
Processing advantages for conspecific vocalizations in human auditory cortex

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Are human vocalizations preferentially processed by the human auditory system? Cortical regions sensitive to conspecific (within-species) vocalizations have been identified in human and non-human primates using functional magnetic resonance imaging (fMRI). In humans, recent fMRI evidence proposes a left-lateralized vocalization processing hierarchy organized along Heschl's gyrus and superior temporal cortices in terms of conspecific communicative locutionary content. Although this hierarchy is well-defined spatially, we sought to characterize its temporal processing dynamics using electroencephalography (EEG). Two classes of vocalization stimuli, real-world animal vocalizations and corresponding human-mimicked versions, were recorded and carefully matched for low-order acoustic features. Throughout each of six trials, subjects passively listened to numerous pairs of vocalizations; evoked-response potentials (ERPs) were subsequently calculated from raw EEG data. ERP waveforms showed an N1 component at approximately 100 ms post stimulus-onset for both classes of stimuli but with significantly greater amplitude for the human mimic sounds. These results suggest that human auditory thalamo-cortical pathways are preferentially sensitive to acoustic signatures intrinsic to the human vocal tract, perhaps affording a processing advantage for conspecific vocalizations.

Biological and Health Sciences Category

Bio & Health Sci Poster 21:

Effects of compassion meditation on stress in response to liked and disliked faces.

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Compassion meditation can help individuals introduce feelings of empathy and kindness into their everyday interactions. We expect that compassion meditation training will allow one to face a disliked person with a less stressful physiological and emotional response. We measured heart rate variability, respiration rate, and skin conductance as well as salivary cortisol and alpha-amylase levels to assess changes in response to viewing liked, disliked, and unfamiliar faces. We also looked at EEG and fMRI data to view differences in neurological responses. We predicted that stress markers would be higher when viewing personally familiar disliked faces than liked or unfamiliar faces, and that these markers would decrease after compassion meditation training. Our preliminary results revealed that stress ratings tend to be higher when viewing disliked faces compared to viewing liked and unfamiliar faces. However, we may need to refine our stimuli to better simulate encounters with these liked and disliked people. Further analysis is necessary to determine whether or not compassion meditation is an effective stress relief method with respect to specific people in our lives.

Biological and Health Sciences Category

Bio & Health Sci Poster 22:

Innovative synthesis of two chiral-centered 1,2-diols via hydrolysis by organogold catalysis

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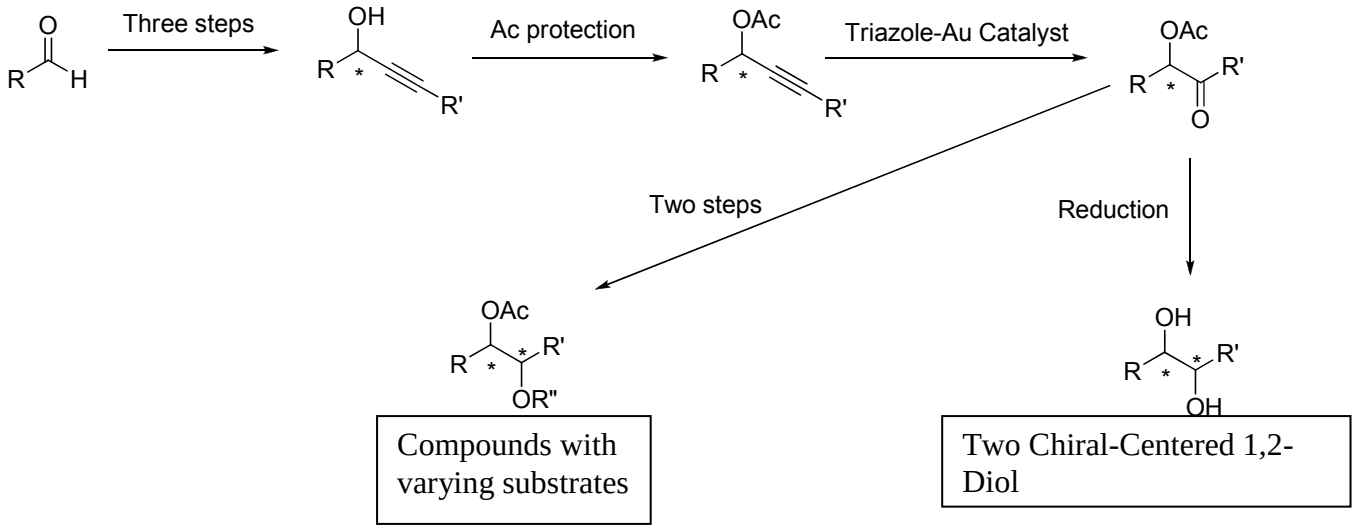
Chiral-diols are vital starting materials for many organic reactions in nature and have great importance in pharmaceutical drugs. However, the synthesis of 1,2-diols can be quite complex because of the two chiral centers that are present. We have developed a straightforward procedure for synthesizing these diols. First, a chiral acetyl (Ac) protected alcohol was synthesized by known means, and then by using our protic-media stable triazole-Au catalyst on an alkyne substrate of the Ac protected alcohol, the production of a ketone on the triple bond was done (refer to the figure below). Finally, the ketone was converted to a hydroxyl group giving a 1,2-diol with two chiral centers. From this procedure, the diols can be individualized with different substrates so that the diol can be utilized in appropriate drugs. Therefore, the tedious synthesis of chiral 1,2-diols can be simplified by not being concerned with the chiral centers by using this catalyst. It can be seen that the ketone generated by the triazole-Au catalyst can be converted to many other functional groups for other specialized reactions.



Agricultural and Environmental Sciences Category

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Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 1:

Evaluating geomorphic differences resulting from mountaintop mining in the southern coal fields of West Virginia

Elise M. Austin, Aaron C. Maxwell, and Michael P. Strager
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As mountain top removal extends throughout the south-central Appalachians, it is important to map and measure the disturbed environment for natural resource management. This study examined the landscape and geomorphic changes induced by mountaintop removal in the southern coal fields of West Virginia through the comparative analysis of LiDAR (light detection and ranging) imagery and photogrammetric-derived DEMs (digital elevation models). Topographic change was investigated from a subset of chosen mine sites over a seven year span. The sites were used to create elevation difference models to determine the geographic change. Elevation difference models alone were unable to produce adequate results; therefore, a set of rules were applied to the geospatial environment to determine major cut or fill volumetric features, as well as to eliminate errors associated with the two different types of DEMs. This study demonstrates how different spatial and temporal elevation models can be utilized to describe major cut or fill features associated with mountaintop mining.

Ag & Env Sci Poster 2:

Fuel properties of co-processed yellow poplar and red maple with bituminous coal

Jordan Holliday[1] and Kaushlendra Singh[2]
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The purpose of this research was to develop hybrid fuel from coal-biomass mixtures for clean energy applications. The feedstock parent feedstock samples (bituminous coal (C), red maple (RM), and yellow poplar (YP)) were mixed together (1:1 ratio by weight) to produce C-YP and C-RM mixtures. These mixtures then were co-processed in sealed reaction vessels at either 300°C or 350°C for one hour. The fuel properties of these co-processed coal and biomass mixtures were then compared with the parent feedstock. This was done by characterizing the calorific value content, specific heat, specific gravity, chemical composition, and proximate and ultimate analyses of each sample. In addition, the feedstock samples and C-YP and C-RM mixtures were characterized for thermo-chemical decomposition behavior during co-processing. The mixtures and co-processed samples were also evaluated for their gasification behavior in partial oxidation conditions. The results showed the hybrid fuels had better fuel properties and gasification characteristics than either biomass, coal, or their unprocessed mixtures. The development of this hybrid fuel made from coal and biomass will benefit the environment through reduction greenhouse gas emissions compared to coal alone.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 3:

DNA aptamer binding to steroid standards for improved determination of steroidal compounds

Laura D. Casto, Ted J. Langan, Vincent T. Nyakubaya, Stephanie A. Archer-Hartmann, and Lisa A. Holland

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Endocrine disrupting steroids, similar to estradiol, present in aquatic environments are threatening to fish reproduction, hence monitoring steroids is crucial for environmental safety. Currently, steroids are measured using antibody assays which, when the antibodies are available, quantify only a single antigen per antibody. Other methods, such as liquid chromatography, are expensive, slow, and require large sample volumes. Capillary electrophoresis performs rapid separations while employing small sample volumes. Modifications to capillary electrophoresis allow analysis of endogenous steroids through stacking for samples from large fish. However, since small fish are used for toxicity studies, an improved stacking technique is necessary. DNA aptamers enhance stacking because they have a higher affinity for steroids than the previous stacking reagent. DNA aptamers incubated to bind to estradiol have been observed to bind with similar steroids—ethynyl estradiol, estrone, and testosterone—as well. This research observes aptamer binding to determine incubation conditions which yield the lowest dissociation constant in order to monitor steroid concentrations in fish plasma using an enhances stacking method of capillary electrophoresis.

Ag & Env Sci Poster 4:

Climate response analysis of old-growth hemlock forests located in West Virginia

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Dendroclimatology, or the science of determining past climates from tree-ring growth, has proven to be a valuable tool for understanding climate before instrumental data existed. Our target species, Eastern hemlock, (Tsuga canadensis Carr.) is valuable with respect to reconstructing climate. This comes as a result of its wide distribution across Eastern North America and its sensitivity to climate. However, an invasive pest known as the hemlock wooly adelgid (HWA) is causing rapid mortality in these hemlock stands. As a result, it is important to understand how hemlock in this area responds to climate, as well as inventory samples for future scientific analysis before the opportunity is lost. In this study, tree cores were collected from two Hemlock stands in West Virginia, presumed to be old-growth (Fanny Bennet Grove and Otter Creek Wilderness). These sites had varying degrees of HWA infestation. Using a process known as crossdating, individual rings from each sample were dated, measured, and recorded into a digital database. At the time of this writing, results are still pending. However, it is expected that samples will show a low correlation with climate and exhibit slowed growth following HWA infestation.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 5:

Production of omega-3 fatty acid enhanced eggs in a pastured poultry system

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Pastured hen egg producers must demand a premium for their eggs due to increased labor and cost of production. This study implemented practical management strategies to increase eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) composition of eggs that may better justify egg premiums due to these fatty acids being associated with numerous health benefits. The experimental design was a split plot, using farm location as the whole plot units (organic farm w/ pasture or conventional farm w/out pasture). Additional treatment structure included a Breed (Red Sex-linked, Single Comb White Leghorns) by Diet (basal diet or basal+1% marine oil) factorial. The experiment was conducted for 5 weeks. Hen performance and nutrient content of eggs were determined. Based on a preliminary study, we believe that hens of either breed fed the basal+1% marine oil diets will produce eggs with the greatest concentration of EPA and DHA (2 eggs = 220mg/day). Hen health is currently being assessed through blood chemistry, liver enzyme analysis, and tibia mineralization measurements

Ag & Env Sci Poster 6:

Interaction between soil physical and fertility properties on miscanthus development

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In 2010, a biofuel crop experiment was initiated at the WVU Organic Farm. This study aimed to study effects of compost application on *Miscanthus sinensis* establishment. Past studies have reported interactions between soil physical and chemical properties during plant development, however, little is known about soil conditions limiting *Miscanthus* production. *Miscanthus* was established with five residual fertility levels (0, 5, 10, 20, and 40 Mg/ha). Saturated hydraulic conductivity, soil fertility properties (bulk density, porosity, aggregate stability, pH, plant available P, K, Ca, Mg, and Zn), and plant growth parameters (height and vigor) were measured to determine statistical significances explaining soil property changes/interactions during *Miscanthus* development. Pearson rank correlation found that *Miscanthus* development was significantly and positively correlated with plant P, Ca, Mg, and organic matter; and negatively correlated to soil bulk density, aggregate size and stability, as well as saturated hydraulic conductivity. Although compost application did affect *Miscanthus* development initially, *Miscanthus* exhibited considerable nutrient use efficiency and resilience over a range of soil physical properties, because later plant measurements were unrelated to compost rate.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 7:

Variation in wood anatomical traits of populus deltoides and populus trichocarpa

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With the recent discovery of the enzymatic conversion of cellulose into ethanol, the use of *Populus* trees as a source of biofuel has become increasingly feasible. In order to facilitate the use of *Populus* in this way, a study was conducted to ascertain a difference within wood anatomy traits between genotypes within a species. Therefore, tissue samples were obtained from two genotypes of *P. deltoides* and one genotype from *P. trichocarpa* and slides of the samples were prepared. The slides were photographed via a confocal microscope with Microsuite Basic Edition Software and the xylem vessel area of each image was measured using ImageJ software. The area data collected was analyzed with statistical analysis software JMP. Results indicate no statistical interspecies variation for individual ramets within a genotype or between branches within a ramet and variation between branch locations within genotype is supported by the data. Confirmation of these wood anatomical trait differences will aid mapping the genomic regions associated with the wood anatomy and ultimately play a role in the selection and manipulation of these traits to yield higher amounts of cellulose, allowing *Populus* to become a viable bioenergy crop.

Ag & Env Sci Poster 8:

The effect of the understory light environment on photosynthesis of American ginseng

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The understory light environment is characterized by low levels of diffuse light punctuated by high levels of direct solar radiation: sunflecks. Similar to the understory light environment, sunflecks are also variable and vary in frequency, strength of photon flux density, and duration depending on the canopy. Sunflecks have been shown to have varying effects on the biomass and photosynthetic capacities of understory plants. In order to observe if sunflecks are affecting photosynthesis of understory plants, a population of the medicinal, understory plant American ginseng (*Panax quinquefolius L.*) and its light environment were studied. HOBO dataloggers were placed in 10 subpopulations of American ginseng to measure the light at 1 minute intervals. A Li-Cor 6400 portable photosynthesis system was used to measure the light saturated net photosynthesis of American ginseng in each subpopulation. Initial measurements have shown a positive correlation between sunfleck frequency and light saturated net photosynthesis and between photon flux density from sunflecks and light saturated net photosynthesis. The results help show how the canopy could be having an influence on photosynthesis of American ginseng, as well as other similar herbaceous, understory plants.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 9:

Determining post-forest fire aspen population structure

Bryce Hartman, Rose Strickland-Constable, Stephen DiFazio
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Following the 1988 forest fire in Yellowstone National Park, a study was done to determine the population structure among regenerated Aspen seedlings. Using RAPD markers, it was concluded the populations had high amounts of structure as indicated by the Fst value of 0.34. (Stevens et al. 1999, Molecular Ecology 8:1769) Regeneration of aspen is almost always asexual, limiting genetic diversity. However, it was hypothesized that the disturbance event created by the fire may have provided the opportunity for sexual reproduction. Now, microsatellite markers (as opposed to RAPD markers) are being used to assess genetic structure for the same seedlings that were used in the previous study. PCR will be completed on the 410 samples using three different primers containing fluorescent dye. The PCR products from the three different loci will then be scored on the ABI3130. Analysis will be completed to strengthen and further justify the results concluded from other loci of the same seedling populations and also adult populations that survived the fire. The results have so far indicated low genetic structure and clonality.

Ag & Env Sci Poster 10:

Discrepancies in predicted Nr-growth relationship of Picea rubens

Brandon Novick, Amy Hessl, Brenden McNeil, Josh Wixom and Brad Breslow
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Increased atmospheric deposition of reactive nitrogen (Nr) has potentially negative effects on forest ecosystems in the Appalachian region. A previous study along an ambient Nr gradient in West Virginia has suggested a strong negative relationship between increased Nr and growth in Picea rubens (red spruce) during the period of 1960-1990. We aimed to determine the strength of this relationship by studying spruce stands along the same gradient at new locations receiving varying levels of Nr. We collected and measured tree ring samples and DBH from each of our new sites. Using these measurements, we calculated basal area increment (BAI) values that are representative of annual growth at the site level. Upon analysis, the input of our data substantially decreased the linear relation of Nr/growth decline from an R^2 of .96(previous study) to .48. The results of this study call into question the scale at which Nr's effects on growth can be successfully analyzed, especially in the midst of other confounding factors like local stand dynamics and average stand age.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 11:

Exploring the uses of chicken litter biochar as a soil amendment in strip mine remediation

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Biochar has unique properties that enable it to retain nutrients and release them over a longer period of time than conventional fertilizers. While doing this it also sequesters carbon from the atmosphere and acts as a carbon sink. The obstacle for chicken litter biochar is that it can be toxic to plants. Therefore few studies have investigating the use of chicken litter biochar as a soil amendment. My study focuses on determining which treatments are necessary to reduce the toxicity of biochar and how application of biochar affects plant germination and growth in mine soil. I grew Lactuca sativa in six treatments of biochar and analyzed differences in germination and growth. The treatments were untreated biochar, biochar after 24 hour water immersion, and biochar after 48 hours of water immersion. All of these treatments were applied at a high (5ton/ha) and low (1 ton/ha) dose. I found that only the high dose of untreated biochar had a significant negative effect on plant germination percentage. All treatments of biochar also grew larger plants than both unamended soil and conventional fertilizer.

Ag & Env Sci Poster 12:

Improved drought tolerance using transient gene overexpression in Petunia (Petunia x hybrida 'Mitchell')

Jenny Druckrey, Youyoun Moon and Nicole Waterland
Division of Plant and Soil Science/West Virginia University, Morgantown, West Virginia 26506

Climate change and increased frequency of drastic weather patterns has initiated research to understand plant tolerance to abiotic stresses including water and heat. Although research of abiotic stress responses is common in major agronomic crops, scientists have limited information on horticultural crops. This has prompted an investigation to identify and characterize genes associated with heat and water tolerance in valuable horticultural plants such as petunia (*Petunia* x *hybrida* 'Mitchell'). Petunia plants underwent Agrobacterium mediated transformation for over and underexpression of cloned heat and drought tolerance associated genes from *Arabidopsis.* Transiently transformed plants received visual evaluation for drought and heat tolerance. Genes that allowed for increased heat and drought tolerance will aid in understanding gene function and the development of heat and drought tolerant crops.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 13:

Spatial representation of water chemistry in Weimer Run, a wetland-dominated, high-elevation, headwaters catchment in Canaan Valley, West Virginia

Jim Fellows, Clayton Lilly and Nicolas Zegre
Division of Forestry and Natural Resources, West Virginia University

Contributions to water flow in Weimer Run by different parts of the surrounding landscape were examined in a high-elevation, wetland-dominated, headwaters catchment in Canaan Valley, West Virginia, an area home to one of the largest wetland complexes in the Appalachians. Weimer Run is a part of the low-order stream network within Canaan Valley vital to the downstream water chemistry and aquatic ecosystems in the Blackwater River basin. Hydrologic tracers analyzed in grab samples taken in and around the catchment included deuterium, oxygen-18, alkalinity, silicates, chloride, and dissolved carbon. Tracer levels at each sample site were weighted using cluster analysis and related spatially using Thiessen polygons in GIS. Discharge measurements above and below the catchment were done using salt slug injections to qualitatively measure potential sub-surface or unsampled water inputs. Water within the catchment is expected to be primarily from groundwater sources. The two ephemeral streams entering the wetland at the top of the catchment are expected to dominate the chemical signature of the stream's water. Spatial representation of the water in Weimer Run will serve as a baseline for further characterization of this particular catchment and will thus lead to better understanding of the hydrology of ecologically important habitat typical to Canaan Valley.

Ag & Env Sci Poster 14:

Temporal analysis of how changing land cover affects stream quality

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Coal mining runoff and valley fills can have adverse effects on water quality in the surrounding watersheds by causing an increase in conductivity and total suspended sediment, which can decrease aquatic invertebrate's richness and affect the fish community (Bernhardt and Palmer, 2011). The knowledge of these spatial consequences of mining activities makes it crucial to understand the temporal effects mining has on the stream's ability to support diverse life. The objective of this study is to understand how increasing mining overtime will affect the stream's ability to support diverse life. This will be done by examining percent change in mining from 2001 to 2010 in West Virginia. Percent change in mining over the ten year period will be analyzed with historic water quality data, specifically looking at conductivity and selenium as well as historic fish data to determine the Index of biotic integrity of the streams within the ten year period. With this information it is expected that with increasing mining over time there will be a significant increase in conductivity and selenium and a significant decrease in biotic integrity.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 15:

Protein and lipid recovery yields using KOH and NaOH in isoelectric-point processing of Rainbow Trout

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Commercial fish processing is primarily a mechanical process involving the removal of the innards and heads of fish to retrieve meat to be sold to consumers. However, the sheer nature of this process allows for a tremendous amount of viable meat to be discarded and wasted. Alternatively, a process called isoelectric point processing (ISP) separates the fish chemically and drastically reduces this loss. ISP uses extreme pH shifts to first solubilize, then precipitate fish protein, salvaging a much higher yield of product than traditional methods. The base used in ISP is traditionally sodium hydroxide (NaOH) as it is extremely effective in isolating the various components of the fish. Unfortunately, its use may deter a new generation of health-conscious consumers from purchasing fish processed with this substance because of an increase in dietary sodium. Medical studies have long linked hypertension and Coronary Heart Disease with increased sodium consumption. Various food companies have responded to demand for lower-salt foods by marketing "salt substitutes" made from potassium chloride (KCl). If similar returns in ISP occur with substitution of NaOH by potassium hydroxide (KOH), perhaps the overall sodium content of the product would be decreased, and thus, sodium-conscious consumer would be allotted more options at the supermarket.

Ag & Env Sci Poster 16:

Tsetse fly (Diptera: Glossinidae) endosymbionts genomic evolution leads to specialization and complementation

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Bacteria, ubiquitous and tremendously diverse, range from free-living to symbiotic. The tsetse fly (Diptera: Glossinidae) provides an excellent model system to examine bacterial evolution in response to symbiosis. Tsetse harbor two enteric γ-Proteobacterial symbionts; the anciently associated, *Wigglesworthia glossinidia* and the recently acquired *Sodalis glossinidius*. Utilizing these symbionts and their differing temporal symbiotic establishments, along with the free-living *Escherichia coli*, we explored how genomes evolve during the transition from free-living into symbiotic lifestyles. Importantly, all three bacteria are believed to have arisen from the same free-living progenitor. Results demonstrate progressive reduction in gene family composition, where large subsets of similar families were lost from *Sodalis*, and more so from *Wigglesworthia*. Several symbiosis significant families were maintained, suggesting functional importance resulting in gene retention. Additionally, we investigated a key *Sodalis* transporter that sequesters thiamine, putatively produced by *Wigglesworthia*, through intron mutagenesis. The importance of thiamine towards *Sodalis* survival and symbiotic homeostasis is discussed. Our findings provide insight into symbiosis, tsetse biology, and the genomic alterations involved in transitioning from a versatile free-living to obligate symbiotic lifestyle.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 17:

Is air pollution helping combat global warming? Evidence from leaf measurements along an atmospheric deposition gradient

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Forests are an essential part of the ecosystem, they provide important carbon and energy cycles for flora and fauna. Nitrogen deposition could affect these important cycles by stimulating carbon uptake and increasing albedo. To test this idea a nitrogen gradient was set up along the Central Appalachian Mountain Range. Our hypothesis for both the Tulip Poplar (Liriodendron tulpifera) and Red spruce (Picea rubens) is that increased nitrogen deposition will cause a higher albedo, higher foliar and soil nitrogen, higher foliar and soil nitrogen 15, lower leaf mass per area (LMA) and lower leaf dry matter content (LDMC). Going up the nitrogen gradient will increase these effects. To test this hypothesis fresh leaf spectra, soil nitrogen, and leaf nitrogen were collected to measure albedo and nitrogen content. Combined with soil respiration and tree-ring data presented by other students we believe that this will be an important first step toward a complete understanding of the input of nitrogen deposition upon carbon and energy cycles. Currently we are awaiting results for the fresh leaf soil nitrogen, and leaf nitrogen.

Ag & Env Sci Poster 18:

Sequencing, assembly and analysis of a 135kb region on maize chromosome 9

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Due to thousands of years of domestication, *Zea mays* (maize) encompasses elevated levels of genetic diversity between individual genotypes, and has therefore served as an excellent model organism for evolutionary genomic studies. Recently, the B73 inbred line has been sequenced, and comparisons of B73 regions with homologous regions in other inbred lines have shown that, although protein-coding genes are conserved in both nucleotide sequence and chromosomal placement, intergenic sequence composition varies significantly. In order to completely understand the complexity of intergenic regions and their contribution to genome evolution, we have sequenced a region of interest in the W22 inbred line on chromosome nine for comparison to the homologous region in B73. Specifically, a bacterial artificial chromosome (BAC) containing the maize W22 region around the *Sh1* gene was sequenced using a shotgun sequencing technique. Approximately 2000 clones were sequenced, allowing for an ~9X coverage of the 135kb region. Assembly and comparative analyses with the B73 will allow for the discovery of sequence variants that differentially impact the expression of neighboring genes.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 19:

Changes in red spruce (Picea rubens) fine root respiration along a modeled nitrogen deposition gradient in West Virginia

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High elevation red spruce (*Picea rubens*) forests in the central Appalachian Mountains are relicts of a larger, endemic spruce-fir zone that was extensively harvested in the early 20th century. Over the past several decades, these isolated populations have experienced growth declines attributed to a host of anthropogenic factors including climate change, atmospheric deposition and logging. In particular, deposition of atmospheric pollutants such as sulfur and nitrous oxides from nearby coal-fired power plants has had a severe impact on red spruce growth and productivity. Because soil carbon balance comprises a considerable flux in the global carbon cycle, we were interested in determining whether chronic atmospheric deposition has a differential effect on soil autotrophic and heterotrophic respiration. To measure and partition between these two components, both fine root respiration and total soil respiration were measured weekly at 7 red spruce sites along a modeled atmospheric deposition gradient using an open-flow infrared gas analyzer and a soil CO_2 flux system, respectively. Data were analyzed to determine the relative contribution of autotrophic respiration to total soil CO_2 efflux and whether this contribution changes along the deposition gradient.

Ag & Env Sci Poster 20:

Parental identification in a sorghum hybrid using SSR marker analysis

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In recent years, sorghum has been identified as a plant with significant promise for the development of biofuels. Determining which genetic and genomic components are associated with favorable traits for biofuel production will aid attempts at cultivation. An S.propinquum x S.bicolor hybrid was generated to create a mapping population of recombinant inbred lines (RILs) for future phenotype-genotype association studies; however, the exact genotype of the S.bicolor parent is currently unknown. Existing documentation indicates that the unknown pollen donor could be one of five improved S. bicolor lines: SC56, Tx7000, B35, Shanqui Red or RTx430. Therefore, DNA was extracted from each of these individuals in addition to the hybrid offspring, and several diverse simple sequence repeats (SSRs) were PCR amplified from each using fluorescent primers. Fluorescent PCR products will be analyzed on the ABI3130, and the results will identify which plant served as the pollen donor. These data are necessary for accurate identification of single nucleotide polymorphisms (SNPs) in the recombinant individuals that will facilitate the elucidation of useful genotypes for biofuel development.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 21:

Effects of consuming different omega-3 PUFA sources on gene regulation of lipid homeostasis in rat liver

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Omega-3 polyunsaturated fatty acids (ω-3 PUFAs) have been reported to influence hepatic lipid synthesis, which reduces lipoprotein and heart disease. Multiple sources of ω-3 PUFAs are being marketed to the public. The study objective is to determine the effect of various omega-3 PUFA sources on liver lipid metabolism. Rats (n=10/group) were fed diets containing 1) corn oil (CO), 2) flaxseed oil (FO) rich in ALA (18:3ω-3), 3) salmon oil (SO) rich in EPA (20:5ω-3), or 4) tuna oil (TO) rich in DHA (22:6ω-3) for eight weeks. Serum lipoproteins were analyzed using colorimetric assays. Liver fatty acids were determined by gas liquid chromatography. mRNA was extracted and gene expression of key regulators of lipogenesis and lipolysis, SREBP-1c and PPARα, respectively, were analyzed using RT-PCR. Serum cholesterol was lower (P<0.05) in SO and TO-fed rats. Liver ALA content was highest (P<0.001) in rats fed FO, EPA was highest (P<0.001) in rats fed SO, and DHA was highest in (P<0.001) rats fed TO and SO. An increase in PPARα and a decrease in SREBP-1c expression in rats fed FO or fish oils are expected due to reports that ω-3 PUFAs increase lipolysis and decrease lipogenesis. TO and SO show the most benefits.

Ag & Env Sci Poster 22:

Panmictic pandemonium: chemotypic diversity of human pathogenic fungus *Aspergillus fumigatus*

Sarah Robinson and Daniel Panaccione
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Aspergillus fumigatus is a global, opportunistic human pathogen. This mold synthesizes a group of mycotoxins called ergot alkaloids. This fungus was previously assumed to be asexual; however, recent studies have demonstrated a sexual state for this pathogen-which may lead to increased diversity for this worldwide mold. Therefore, we hypothesize that *A. fumigatus* will harbor variation in the chemotype of ergot alkaloids, genotype of the ergot alkaloid gene cluster, and the phenotype of isolates collected from around the world. Chemotypic analysis of thirteen isolates by high performance liquid chromatography revealed four distinct ergot alkaloid profiles. Variation in the ergot alkaloid gene cluster was demonstrated through PCR. Isolates also exhibited differences in pigmentation and sporulation. Even with limited samples available, we have revealed tremendous diversity within this worldwide fungus, including in its biosynthetic capability of an important class of mycotoxins.

Physical Sciences and Engineering Category

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Physical Sciences and Engineering Category

Phys Sci & Eng Poster 1:

Optimization and construction of bulk heterojunction polymer–fullerene composite solar cells

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The use of Solar devices have long been thought of as feasible alternatives to help relive the use of fossil fuels. Today's most efficient solar devices are made for a Silicone based monocrystalline or polycrystalline films, which are very costly and hard to produce, with an efficiency reaching upward of 40-50%. By using bulk heterojunction organic solar devices, we hope to make devices with a relatively high efficiency and a much lower cost with more applications such as flexible solar devices, which could be weaved into garments to charge electronics, in addition to ridged solar devices. Using polymer-based donor materials with C70-Fullerene derivatives in a bulk heterojunction architecture; it is hoped that by varying the parameters during the construction of the solar cell, a high efficiency may be obtained. By using varying the thickness of the active layer, along with using Lithium Fluoride as an anti-hole blocking layer, an efficiency of 0.48 % was obtained. Just by changing the parameters of the solar device's construction an increase of 0.36% was seen from previous fabrications.

Phys Sci & Eng Poster 2:

Synthesis and luminescence properties of YVO_4:Eu and YVO_4:Tb nanoparticles for optical applications

Anya Leach, Tess Senty, Mohita Yalamauchi, Alan Bristow and Mohindar Seehra,
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The optical properties of YVO_4 semiconductors doped with Eu^{3+} and Tb^{3+} ions have been investigated for future display applications due to their high photoluminescence (PL) quantum yields upon UV excitation. In doped YVO_4, energy is transferred through the host lattice to Eu^{3+} and Tb^{3+} resulting in red and green PL emission lines respectively. These particular emission lines have applications from bio-imaging to replace unstable organic chromophores as luminescent probes to optoelectronics based on the semiconductor property to solid-state lighting as LEDs, cathode ray tubes in TVs, even traffic lights. Hydrothermal techniques at 200 C were used to synthesize the doped YVO_4 for different doping percentages. X-ray diffraction (XRD) revealed that samples possessed the same tetrahedral, zircon-like crystal structure as the original material. Optical analysis of Eu^{+3} doped samples confirmed previous studies by producing red emission peaks at 618nm. For Tb^{3+} doping, only limited success was achieved in the short time available for this project. Details of the procedures used for synthesis, XRD characterization of the synthesized materials and PL spectra will be presented.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 3:

Thermoelectric properties and microstructure analysis of $Ca_3Co_4O_9$ polycrystalline ceramics

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Thermoelectric (TE) materials are a promising solution to critical energy issues due to their ability to directly convert heat into electricity. Among TE materials, $Ca_3Co_4O_9$ (CCO) is a prominent candidate due to its high conversion efficiency and relatively high thermal stability. Improving the conversion efficiency through impurity doping and nano-inclusion into the CCO materials is a current challenge for CCO development. In our project, baseline pure CCO powders were prepared by the Sol-Gel method, pressed into pellets, and then annealed at various temperatures. The thermoelectric properties of the CCO pellet were measured using the Seebeck measurement system and laser flash analyzer. The microstructure and chemistry were analyzed by scanning electron microscopy (SEM), x-ray diffraction (XRD) and transmission electron microscopy (TEM). The pure CCO pellet has relatively high energy conversion efficiency and possesses a figure of merit of about 0.2 at 700^{o}C. The SEM and XRD results show that the pellet has a uniform microstructure and consists of single phase CCO. However, the TEM results show the existence of spurious phases at the nanoscale.

Phys Sci & Eng Poster 4:

Influence of spacer length on activity and stability of enzymes immobilized onto nanotubes

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Enzymes are biological catalysts used in common household products, such as paper and detergents, or as biosensors. However, such applications require enzyme immobilization and sustained enzyme activity and stability. This study is aimed to investigate the relationship between the enzyme, its immobilization support, and how this can be controlled to create enzyme-based conjugates with enhanced catalytic power. The strategy developed relied on the immobilization of a model enzyme, soybean peroxidase, onto multi-walled carbon nanotubes with different surface properties using covalent bonding and carboxyl-polyethylene glycol (PEG)-amine spacers. The hypothesis was that using a spacer would bring the enzyme away from the nanosupport, thus reducing enzyme-unspecific binding and potentially leading to enhanced activity and stability. Spacers of different lengths (1.8, 3.22, 4.65, 8.88 nm) and nanotubes with different surface properties were employed to achieve this effect. Atomic force microscopy and Fourier infrared spectroscopy confirmed enzyme activity and stability through the method of immobilization. Further research will focus on enhancing enzyme stability to improve enzyme functions for application at an industrial scale.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 5:

Electrospun nanofibers $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ (LSCF) and $Ce_{0.8}Gd_{0.2}O_{1.9}$(GDC) for solid oxide fuel cell(SOFC) cathode

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When trying to make a fuel cell cheap enough for use in the world there are a few road blocks. One is that the fuel cell relies on the reduction of the cathode. But for this reaction to occur it must be at a high heat. To try to lower this heat we try to make it easier for the reaction to occur. By using $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ (LSCF) and $Ce_{0.8}Gd_{0.2}O_{1.9}$(GDC) we can have the LSCF and GDC collect the oxygen from the air and then transport it to the electrode for the reaction to occur. This requires a lot of surface area for more reactions. We use nanofibers so that the surface area is maximized and not only that but the two fibers must have a continuous connection. For this we use the electrospinning process making the polymer negative and a collection plate positive and subject it to high voltage. Right now the work is still ongoing because we have still yet to place the needles right to created that continues connection.

Phys Sci & Eng Poster 6:

Microfabricated microfluidic scaffolds for microvessel networks

Erin Gallagher[1], Xiang Li[1], Yuxin Liu[1,2]
[1]*Lane Department of Computer Science and Electrical Engineering*
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Tissue engineering has exponentially grown in the last decade. One long-standing challenge is to form functional microvessel networks that can approximate physiological conditions *in vivo.* In this project we developed an approach to create a microfluidic channel network to closely approximate the geometries and shapes of a microvessel network *in vivo*. Briefly, conventional photolithography techniques were used to fabricate the network mold, and then, soft lithography techniques were used to replicate the mold and generate a microfluidic channel network in polydimethylsiloxane (PDMS). A micromolded gelatin mesh, which will serve as a sacrificial element for further fabricating the networks in matrix gel, was fabricated from the PDMS channels after liquid gelatin was cured and released. The processes provide a convenient method for the formation of a microfluidic gel with pre-fabricated networks inside, which will potentially be used as the scaffold for the creation of microvascular vessel networks.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 7:

Development of immersive software solutions for academia

Frank Hamilton, Powsiri Klinkhachorn, Penprapa Klinkhachorn, and Frank Reilley.
LANE Department of Electrical Engineering and Computer Science and Department of Health Sciences, West Virginia University, Morgantown, WV 26506.

Software for educational purposes is an excellent way to make learning more interactive. The process of making this software is often left to a computer programmer, who knows nothing of the subject matter. The best way to get around this fault is to create easy to manipulate templates. That way someone who is familiar with the field can create the content, while the more software related portion is controlled by computer programmers. An approach has been undertaken by the health sciences department in this fashion. The first attempt was still very difficult for health department staff. The current templates developed in this research will assist staff to create their own educational software through a more streamlined and commented template system. These templates also accommodate mobile platforms, which allows students to use the educational software on the go. These templates will be applied to the health science department and will be investigated in other fields.

Phys Sci & Eng Poster 8:

Synthesis and characterization of by-products of cobalt catalysts used in the Fischer-Tropsch process

August S. Powers, Vivek Singh, Mohindar S. Seehra
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The Fischer-Tropsch process is an important series of chemical reactions that converts hydrogen and carbon monoxide into hydrocarbons; the reactions are generally used to form transportation fuels. To assist the practicality and efficiency of the synthesis, many catalysts have been designed; the basis of the catalysts are primarily iron or cobalt. Previous analysis of used cobalt-alumina and cobalt-silicate catalysts via x-ray diffraction (XRD) showed two distinctive peaks that were unable to be reliably identified. The focus of this project was to synthesize compounds that were suspected to account for these peaks, therefore being by-products from the Fischer-Tropsch reactions. The primary suspect compounds were the cobalt carbides (Co_2C and Co_3C), as they had been previously reported as possible by-products. These carbides were synthesized using a polyol reduction accompanied by a cobalt salt. The method was slightly modified for safety and practicality with the available resources; some success in synthesizing the carbides was achieved. This work demonstrates an interesting synthesis method and illustrates the principles and application of XRD to nanotechnology and industrial processes.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 9:

Analysis of droplet impact for simplified spray cooling simulation

Harry Shaffer, John Kuhlman, Stephen Taylor, and Nick Hillen
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Spray cooling is becoming an increasingly important technique for dissipating heat generated by electronic devices. With the decreasing size of electronics, more heat is being generated in a smaller volume, making such devices prone to over-heating. The danger of over-heating these electronics requires an improved cooling mechanism. Spray cooling has proven to be an effective cooling method, which can dissipate up to 1000 W/cm^2 using water as the coolant. The impact of each drop from a spray nozzle causes complex thermal interaction with the surface to be cooled. Modern computer simulation of such events can take days or even months to compute. The primary change in heat transfer is caused by the impact of individual drops on the cooled surface and the craters formed by these drops. By developing a correlation between initial droplet size and velocity with the size and lifespan of the crater formed, spray cooling simulation can be simplified and the cooling efficiency of a nozzle can be estimated by analyzing the spray.

Phys Sci & Eng Poster 10:

Fabrication of a cylindrical microfluidic microvascular channel

Joseph A Douglas II, Zhouchun Huang, and Yuxin Liu*
Lane Department of Computer Science and Engineering and Mineral Resources West Virginia University, Morgantown, WV 26506

Having the ability to control the process of angiogenesis and its ability to form new blood vessels would open up many clinical applications to help treat for example numerous cancers, tumors, and vascular diseases. In this study we work on the creation of a micro-channel in the shape of microvascular vessel by conventional photolithography and soft lithography methods. We successfully demonstrated that a cylindrical microfluidic channel can be created in polydimethylsiloxane (PDMS). Our next step is to grow the microvascular cells in the channel for identifying the capability of cell monolayer formation inside of the channel by coating them with proteins such as collagen or matrigel.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 11:

Patterning of graphene on thin insulating films using halogen based plasma etching

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Graphene exhibits high electron and hole mobility, making it a promising material to be used in nanoelectronic circuit applications. Our research has previously shown that graphene films, with thicknesses of one to four layers, can be formed on 6H-SiC by CF_4 based inductively coupled plasma-reactive ion etching (ICP-RIE) followed by thermal annealing of the modified surface. The focus of this study was the patterning of graphene onto the 6H-SiC surface. This involved the deposition of an oxide film that acted as a mask during the plasma etching process; also, this oxide was coated with an aluminum film to augment its resistance to the CF_4 plasma etch. Windows were opened in these films using a lift-off process and a buffered oxide etch. ICP-RIE was then performed to form the graphene regions. These surfaces were then analyzed by X-ray photoelectron spectroscopy and Raman spectroscopy to determine their composition. This research represents the first steps toward patterning large area graphene-on-insulator films and the fabrication of electronic devices on these films.

Phys Sci & Eng Poster 12:

Hot-carrier dynamics in GaAs

J. Kevin Pierce and Alan D. Bristow
Department of Physics, West Virginia University, Morgantown, WV 26506-6315

In order to design and create high-speed electronic and photonic devices, it is essential to understand the carrier dynamics of the semiconductor from which they are made. Optical injection of carriers leads to a change in the refractive index and hence the reflectivity. In this work, carriers are injected optically at densities between 10^{18} and 10^{20} cm^{-3} and the relaxation is monitored using photon-energy-dependent transient reflectivity measurements with 100-fs temporal resolution. Far above the electronic band gap hot carriers are created that cool through phonon emission and electron-electron scattering before undergoing interband relaxation. A transition between non-thermalized and thermalized carrier distributions is observed from which the independent rates for the various mechanisms can be extracted. The injected carriers lead to phase-space filling due to the limited number of excitation states, band-gap renormalization through Coulomb repulsion, and free-carrier absorption from the new carrier population.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 13:

Using the discrete wavelet transform to digitally watermark text based information in pictures

Jacob Steele[1], Afzel Noore[1], Mayank Vistas[2]
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[2]*Indraprastha Institute of Information Technology, Delhi, India*

With the growth of the internet and digital information, digital intellectual property has grown both in size and scope. Digital fraud, because of the growth, has also grown and has added a major level of copyright complexity. One of the initial attempts to maintain copyright protection was the embedding of logos into digital pictures. This technique, called Digital Watermarking, has grown to encompass both copyright protection of digital data as well as storing collections of data in a single file, such as storing voice patterns inside of a facial image for biometric applications. The technique that is most widely used to facilitate the embedding in a secure manner is the Discrete Wavelet Transform. The process and algorithm of embedding text-based information into digital pictures using the Discrete Wavelet Transform is discussed. Also, several possible applications of this form of Digital Watermarking will be addressed. Furthermore, the hardware needed for the creation of a text embedding system will be examined.

Phys Sci & Eng Poster 14:

Designing a new keystroke pattern analysis algorithm

Joseph A. Yaworski and Bojan Cukic
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Keystroke dynamics is the process of analyzing and using habitual typing patterns for identification and authentication purposes. They are an exciting topic in today's biometric literature. However, because keystroke dynamics are an emerging biometric trait, there is a lack of data sets publicly available for the research concerning which combination of features, feature selectors, and classifiers are the most accurate for human identification. In this project, a new keystroke dynamics data set will be created based on the participation from at least 50 individuals. In the ensuing research, several popular feature selection and classification algorithms will be evaluated. A new keystroke dynamics human identification algorithm based on the lessons learned from the comparison of existing ones will be proposed. The new algorithm's performance will be evaluated on multiple and diverse data sets. This project can be applied to the development of other new keystroke dynamics algorithms to improve their efficiencies and accuracies.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 15:
Characterization of indium gallium nitride LEDs for low power applications

K. R. Hite [1,] K. Lee [1], L. E. Rodak[1], V. Kumbham[1], V. Narang[2], A. Kadiyala[1], R. Goswami[1], B. A. Bearce[1], J. Peacock[1], L. A. Hornak[1], and D. Korakakis[1]
[1]*Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26506, USA*
[2]*Department of Physics, West Virginia University, PO Box 6315, Morgantown, WV 26506 U.S.A.*

Solid state lighting is vital for several applications including low power lighting for residential and industrial usage and replacing current televisions pixels with micro scale red, green, and blue Light Emitting Diode (LEDs) to act as a pixel. The foundation of the effort is described by LED characterization. P and n-type layers surround an active layer of InGAN/GaN quantum wells. This methodology of characterization is critical in order to establish a consistent standard across a spectrum of devices under varied design processes. Indium gallium nitride (InGaN) LED devices were inundated with a set of distinct I-V curves using a semiconductor parameter analyzer. The figures generated from this treatment provide LED parameters including the turn on voltage and the internal resistance. CCD Array Spectrometers can be used to mean the optical output spectra of the LEDs. Characterization results will be presented in addition to methodologies developed for extraction of important device parameters.

Phys Sci & Eng Poster 16:
Design and fabrication of photonic crystals for integration with a waveguide

Kathryn L. Smith*, Bradley D. Potteiger†, Chloe E. Snyder, Bashar M. Hamza, Anand Kadiyala, and Jeremy M. Dawson
Lane Department of Computer Science and Electrical Engineering, West Virginia University, Morgantown, WV 26506-6045

The optical properties of photonic crystals (PhC) invite many possible biosensing modalities. One such modality is via excitation of a fluorescent-labeled analyte within a PhC cavity, resulting in confinement and enhancement of the fluorescent emission. The purpose of this project was to design and fabricate a PhC with a band gap corresponding to fluorescent biomarker emission, and to prepare the PhC to be integrated with a waveguide, enabling characterization and optimizing excitation beam injection. A PhC lattice of air holes in Silicon was simulated using MPB, a free software package that solves Maxwell's equations to compute dispersion relations. Lattice parameters for fabrication (a=263 nm, r=79 nm, h=260 nm) were extracted from these simulations. Electron beam lithography was used to fabricate these nanostructures on a silicon-on-insulator (SOI) wafer. The exposure dosage was varied to optimize the resulting dimensions of the PhC, with a final optimal dosage of 63 $\mu C/cm^2$. Alignment marks were designed around the crystal to facilitate integration of a waveguide that will be used to characterize the PhC and confirm the band gap properties.

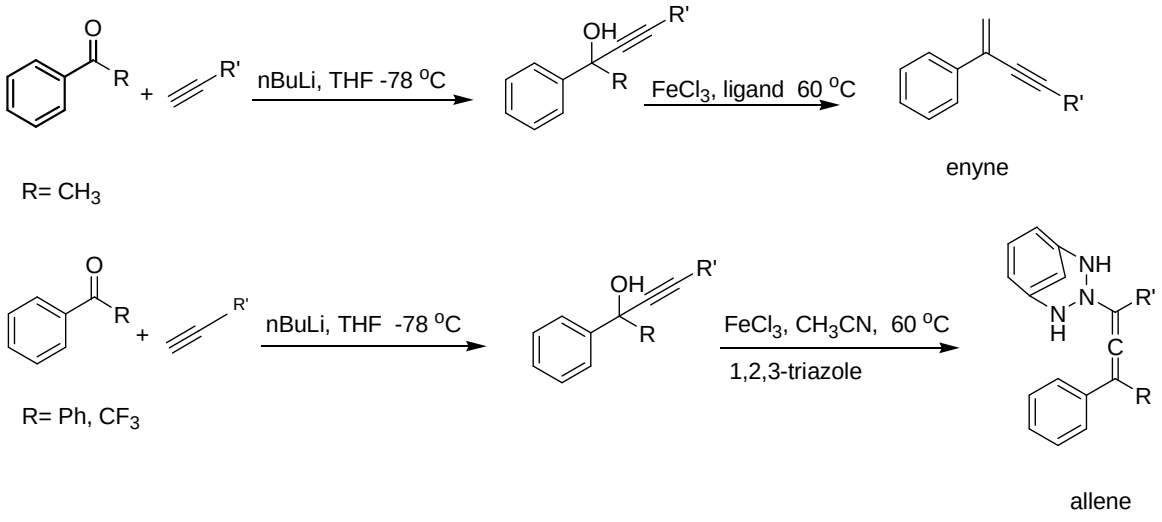
Physical Sciences and Engineering Category

Phys Sci & Enq Poster 17:

Novel synthesis of allenes and enynes

Keith Weise*, Wuming Yan, and Xiaodong Shi*
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, West Virginia 26506

Allenes and enynes are organic molecules with unique properties. Many of these properties could hold benefits for mankind, but the study of these two classes of molecules is plagued by inefficient, multi-step syntheses. We have developed a reaction sequence that can synthesize both allenes and enynes in high yield in just two steps from inexpensive starting materials. First, electrophilic addition was used to attach an alkyne functional group to the alpha-carbon of a benzyl aldehyde or ketone at -78 deg Celsius. Next, the hydroxyl group was eliminated from the resulting tertiary propargyl alcohol by iron (III) chloride at room temperature. The starting material determines the regioselectivity of the reaction; if a hydrogen is available for removal from a beta-carbon during the elimination, then an enyne is formed; if no hydrogen is available for removal, an allene is formed. We believe that this fast, efficient synthesis will enable researchers to better explore the possibilities inherent within allenes and enynes.



Physical Sciences and Engineering Category

Phys Sci & Enq Poster 18:

Multiferroic multilayered nanostructures

Nicholas Horvath[1], Daniel Marshall[2], Felio Perez[1], David Lederman[1]
[1]Dept. of Physics, West Virginia University, Morgantown, WV
[2]Dept. of Physics, Pennsylvania State University, State College, PA

This project aims to grow and characterize multiferroic oxide materials. Multiferroic materials have both ferroelectric and ferromagnetic properties that lead to interesting uses in magnetoelectric devices. Previous research has shown that $YMnO_3$ has desirable ferromagnetic properties and $YInO_3$ has desirable ferroelectric properties. The objective is to use molecular beam epitaxy (MBE) to integrate both of these properties into one multiferroic crystal thin film composed of layers of $YInO_3$ and $YMnO_3$ for use in a field effect transistor. This transistor could be maintained by its electric and magnetic polarizations, and would require less power. Currently the ferroic properties of a single layer of $YMnO_3$ and a single layer of $YInO_3$ have been investigated, with the latter exhibiting more pronounced ferroelectricity. X-ray diffraction (XRD), reflection high energy electron diffraction (RHEED), atomic force microscopy (AFM), and ferroelectricity testing methods have shown that the multilayered structure is easily achieved but monocrystallinity is not. Ferroelectric measurements are currently underway.

Phys Sci & Enq Poster 19:

Role of WISP-1 in the suppression of Interleukin-12 signaling in immune cells

Nathan K. Mickinac.[1] Emily B. Chambers.[2] David J. Klinke II.[1,2]
1. Department of Chemical Engineering, West Virginia University, 2. Department of Microbiology, Immunology, and Cell Biology, West Virginia University

An emerging hallmark of cancer is that malignant cells suppress anti-tumor immunity. Host immunity is a complex process that is regulated by secreted biochemical cues (cytokines). One key cytokine that regulates cytotoxic immunity is Interleukin-12 (IL12). We have previously observed that melanoma cells also secrete biochemical cues that suppress the cellular response to IL12. One of the proteins secreted by melanoma cells, as modeled by the B16 cell line, is WNT1-inducible-signaling pathway protein 1 (WISP-1). WISP-1 is a member a family of growth factors that has several effects on tumor growth and tissue development. We hypothesize that WISP-1 suppresses the response of an immune cell model (2D6 cells) to IL12. Our approach to test this hypothesis was to knock down the production of WISP-1 via transfecting siRNA and to assess the impact of WISP-1 expression on a co-culture of 2D6 with B16 cells. On-going results will be discussed, which focus on determining the initial levels of WISP-1 present in B16 cells within the co-culture assay.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 20:

Young neutron stars in extragalactic supernovae

Nathan A. Tehrani and Duncan R. Lorimer
Eberly College of Arts and Sciences, Department of Physics, West Virginia University, Morgantown, WV 26506-6045

Pulsars are compact remnants of stellar cores left behind by supernova explosions. They spin rapidly and emit electromagnetic radiation from their magnetic poles, and gradually lose rotational energy. This project tests and expands upon a previous prediction by Perna et al. for the initial spin rates of neutron stars by attempting to model the x-ray emission from extragalactic supernovae. A computer simulation will generate a set of pulsars of known initial rotational periods, magnetic field strengths, and ages, and will calculate the expected x-ray luminosities from the known relationship between magnetic field strengths, slow-down rates, and radio luminosities. This experiment will expand upon the original research by incorporating variability in the angle between the magnetic and rotational axes of each pulsar, which in the original publication was ignored. This will examine the effect of the angle on pulsars' x-ray luminosities. The simulated x-ray luminosities will be compared to the known x-ray luminosities of known supernova explosions, which will serve as an upper limit to determine the highest possible initial rotation speeds. The results are pending as this research project has not concluded.

Phys Sci & Eng Poster 21:

A mechanistic study of the self-propelled motion of asymmetric "Janus particles"

Seth C. Burkert and Lloyd R. Carroll
Department of Chemistry, West Virginia University, Morgantown, WV 26506-6045

With the discovery of self-propelled catalytic nanoparticles exploration in application of self-propelled motion has grown in popularity. In this study, self-propelled Janus particles are captured by high frame rate microscopy and analyzed. Janus particles are particles that are made up of two distinct halves forming asymmetry around the center of the particle. The Janus particles used in this study were produced by evaporating platinum onto a silica bead covering roughly half the bead. When placed into a solution of hydrogen peroxide, the platinum catalyzes the decomposition of hydrogen peroxide resulting in motion of the particle. The mechanism of movement is a subject of intense debate in the scientific community. Through variation of solution properties including ionic strength, viscosity, and pH we aim to affirm or negate proposed mechanisms for autonomous motion.

Physical Sciences and Engineering Category

Phys Sci & Eng Poster 22:

Suppressor of cytokine signaling (SOCS3) selectively regulates different branches in IL-12 signaling pathways

Shannon Gribbons.[1] Emily Chambers.[2] David J. Klinke II.[1,2]
[1]Department of Chemical Engineering, West Virginia University, [2] Department of Microbiology, Immunology, and Cell Biology, West Virginia University

Cells sense and respond to their environment through a series of protein-protein interactions. These interactions collectively form signaling pathways. Signaling pathways are regulated dynamically by proteins that exert positive and negative feedback on the pathways. We have previously observed two signaling proteins, STAT1 and STAT4, that regulate unique cellular decisions are differentially regulated downstream of the Interleukin-12 receptor. We hypothesize that SOCS3, a negative regulator of the signaling pathway, differentially regulates the activation of STAT1 and STAT4 by the IL-12 receptor. Our approach is to silence SOCS3 gene expression using siRNA and to observe the dynamics of STAT1 and STAT4 activation in response to IL-12. Results from our on-going work will be discussed, focusing on optimization of the transfection protocol and the development of an assay for determining the transfection efficiency in 2D6 T cells. Understanding how SOCS3 selectively regulates cell signaling pathways may lead to a better understanding of instances where cell signaling pathways become dysregulated, such as in psoriasis and cancer.

Phys Sci & Eng Poster 23:

Solid-state capping molecule exchange of CdSe quantum dots

Timothy Ryan Potteiger[a], Yiqiang Zhang[b], Xian-an Cao[b]
[a]Department of Computer Science and Electrical Engineering
University of Maryland, Baltimore County, Baltimore, MD 21250
[b]Lane Department of Computer Science and Electrical Engineering
West Virginia University, Morgantown, WV 26506

Studies of quantum dots have brought about many solutions in terms of achieving optimal electronic properties. Many of which involve the quantum dot solution undergoing an aqueous exchange of the organic capping molecules with more conductive inorganic molecules. However, spin coating after the aqueous exchange is made difficult due to aggregation. So, in order to account for this problem, we are testing the efficiency of a solid-state capping molecule exchange. Our experimental plan involves spin coating the quantum dot solution onto a glass substrate and soaking the substrate in a solution of $NaSnS_4$ and ammonium hydroxide for various times to get an idea of how long the exchange in this state takes. So far, from measuring the absorption spectra at various times, the slope has appeared steeper at lower wavelengths and the spectra has significantly broadened which was expected from the exchange. Yet, to truly determine if the exchange is successful, we will use a FTIR spectrometer to determine if the films are absent of organic material and present the results.

Nanosciences Category

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Nanosciences Category

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Poster 16: *Using ligand exchange to understand the kinetics of surface interactions of superparamagnetic iron oxide nanoparticles.* Steven J. McHenry, Aaron L. Routzahn, and R. Lloyd Carroll

Poster 17: *Deducing effects of environment on β-cyclodextrin and azobenzene self assembly structures.* Scott Tull

Poster 18: *Methylene blue modulates polyglutamine peptide aggregation.* Sam Umbaugh, Kathleen Burke, and Justin Legleiter

Poster 19: *Characterization of indium gallium nitride multi-quantum well LEDs for biosensing and illumination applications.* Benjamin A. Bearce, Kennith Hite, Vamsi K. Kumbham, Rohit Goswami, Srinitya Musunuru, Kyoungnae Lee, Lee Rodak, Dimitris Korakakis, Lawrence Hornak

Poster 20: *Synthesis and characterization of Cu_2ZnSnS_4 and CdSe nanoparticles.* Brooke E. Bertus, Liu Yi, Hao Zhang

Poster 21: *The longterm antimicrobial effects of self-assembled peptide nanofibers with silver nanoparticles.* Ian Thistlethwaite, Yongguo Wang, Lina Cao, Shuwen Guan, Guannan Shi, Quan Luo, Lu Miao, Jiayun Xu and Junqiu Liu

Poster 22: *The role of specific amino acid sequences of Aβ on amyloid formation.* Michael F. Lynch, Elizabeth A. Yates, and Justin Legleiter

Nanosciences Category

Nano Sci Poster 1:

Multilayered multiferroic nanostructures

Daniel E Marshall, Nick Horvath, Felio A Perez, David Lederman
Department of Physics, West Virginia University

The goal of this project was to grow and characterize multiferroic oxide materials. Multiferroic materials have both ferroelectric and ferromagnetic properties that lead to interesting uses in magnetoelectric devices. Previous research showed that $YMnO_3$ has desirable ferromagnetic properties and $YInO_3$ has desirable ferroelectric properties. Thus the goal was to integrate both of these properties into one multiferroic crystal, i.e., to grow an artificial multilayered crystal of $YMnO_3$ and $YInO_3$ via molecular beam epitaxy (MBE). Crystals grown via MBE are thin films with thickness usually on the scale of nanometers. Characterization was done using x-ray diffraction, reflection high energy electron diffraction (RHEED), atomic force microscopy (AFM), as well as advanced electronic characterization methods. As determined by low angle x-ray diffraction, the first sample was layered but not monocrystalline. We are still in the process of ferroelectric characterization. Further results indicate monocrystalline growth of the multilayer may not be feasible.

Nano Sci Poster 2:

Integration of waveguides and photonic crystals for optical characterization of photonic band gaps

Bradley D. Potteiger[a], Kathryn L. Smith[b], Chloe E. Snyder[c], Anand Kadiyala[c], Bashar M. Hamza[c], Jeremy M. Dawson[c]
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West Virginia University, Morgantown, WV 26506

Photonic crystals (PhCs) are the central component of many optical-based biosensors that can be used to identify DNA, bacteria and biomolecules. Before these systems can be implemented, the PhCs must be evaluated in order to characterize the photonic band gap and other optical properties. This research focuses on the design, fabrication and characterization of waveguide structures that can be used to characterize these optical properties. In addition, these waveguide structures can be used to deliver excitation energy needed for on-chip fluorescence spectroscopy. Modeling tools, including OptiFDTD and MIT Photonic Bands (MPB), were utilized to determine optimal parameters for efficient light transmission through a waveguide and for band gap analysis of PhCs respectively. Fabrication of 10µm-wide silicon optical waveguides designed for 1100nm emission was demonstrated on a silicon-on-insulator (SOI) substrate. Successful integration of PhC structures with these waveguides has been accomplished. The characterization results of the integrated system are presented.

Nanosciences Category

Nano Sci Poster 3:

Microfluidic separation of glycans using phospholipids

Cassandra L. Crihfield, Xingwei Wu, Stephanie A. Archer-Hartmann, Sharon L. Athey, Lisa A. Holland.
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV, 26506

The difference between a healthy and cancerous cell can be determined based on the presence of certain glycans; therefore, glycan separation and analysis is a crucial research field. Past methods of separation lack the ability to clearly distinguish the difference between similarly structured branched glycans. Capillary electrophoresis is a microscale separation technique in which analytes are separated based on charge-to-size ratio. An innovative phospholipid additive used in capillary electrophoresis was recently reported. The highly viscous additive increases analyte migration so that even isomeric glycans differing in bond orientation are separated! For the first time, this technique is implemented in a micro-chip to enable portable and rapid glycan separations. The device has the potential to be mass produced to decrease the cost of each chip.

Nano Sci Poster 4:

Bio-inspired surfaces displaying stable and temperature dependent wettability

Cody White, Dong Chao, and Bai Yang
State Key Laboratory of Super-molecular Structures and Materials, Jilin University, Changchun, Jilin Province, China 130021

Science is continually inspired by the natural world around us. To replicate and further understand nature, surface structures that alter how a material interacts with a liquid, have been created. Using the interface method for colloidal lithography, polystyrene micro-spheres were applied to the surface of common polymers. After application, controlled reactive ion etching was used to create various types of hollow-tip conical arrays on these surfaces. To extend possible applications of these surfaces, 'atom transfer radical polymerization' was used to apply PNIPAM. PNIPAM's structure is temperature dependent and significantly alters wettability when exposed to conditions below 32° C. This dynamic wettability can lead to new methods of oil clean up, the creation of unique sensors, and enhanced drug delivery systems. Results show that PNIPAM is durable, unaffected by various temperature changes over time. Results also show that this process can be applied to various materials, achieving different but characteristically similar results. In practice, one can change the contact angle of a liquid from 32° to 149° multiple times with the flip of a switch.

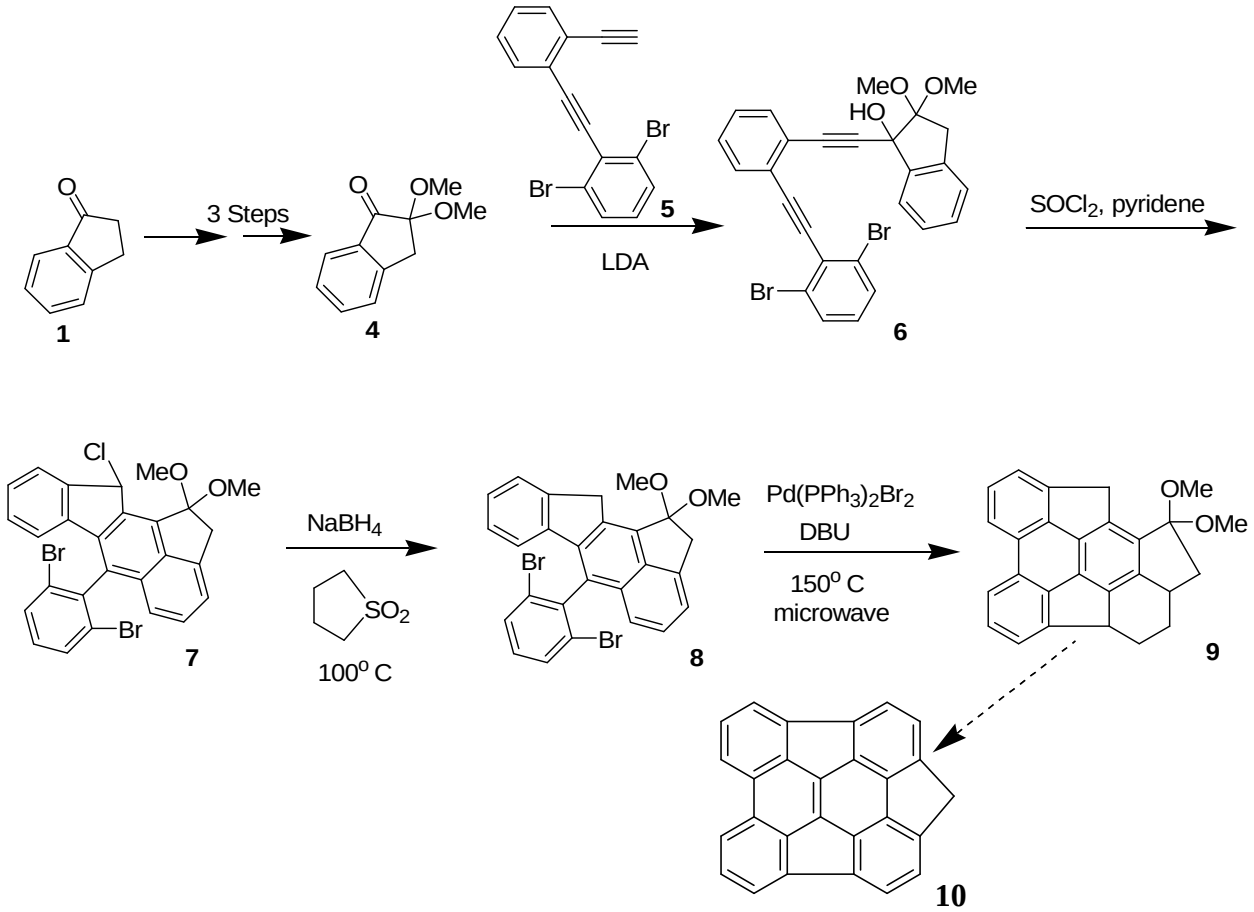
Nanosciences Category

Nano Sci Poster 5:

Synthesis of bowl-shaped polycyclic aromatic hydrocarbon $C_{27}H_{12}$ bearing a 27-carbon framework on the surface of C_{60}

Dilip Nagisetty, Changfeng Huang, Yiwei Huang, and Kung K. Wang
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV, 26506-6045

The synthesis of a bowl shaped polycyclic aromatic compound $C_{27}H_{12}$ **(10)** with a 27-carbon framework that can be mapped onto the surface of C_{60} is currently under development. The synthetic scheme involves a sequence of seven steps starting from 1-indanone, outlined below. Commercially available 1-Indanone **(1)** was first converted to 2,2-dimethoxy-1-indanone **(4)** in 3 steps by a reported procedure. Alkyne **(5)** was also synthesized by the same reported procedure in our laboratory. The reaction condition for the condensation between the substituted 1-indanone (**4)** and alkyne (**5)** to form propargylic alcohol (**6)** is currently being investigated. The thionyl chloride promoted cascade cyclization reactions of **(6)** could lead to benzofluorene **(7)**. Reduction of **(7)** with sodium borohydride followed by the palladium catalyzed intermolecular arylation reaction of **(8)** could lead to the desired bowl shaped polycyclic aromatic compound **(9)**. The reaction conditions to convert bowl shaped polycyclic aromatic compound **(9)** to $C_{27}H_{12}$ **(10)** is currently under development. This partially bowl shaped polycyclic aromatic hydrocarbon $C_{27}H_{12}$ resembling a semi buckminsterfullerene could serve as a precursor to larger geodesic fullerene fragments and end-cap templates for [6,6]carbon nanotubes.



Nanosciences Category

Nano Sci Poster 6:

Photoisomerization of azobenze functionalized surfactant chains and the accompanying aggregation behavior of surfactant encapsulated polyoxometallates

Eamonn Maher, Lixin Wu, Yang Yang, and Liang Yue
Supramolecular State Key Lab: Jilin University

Creating self-assembling structures is an area of focus in supramolecular chemistry because of its potential application in the fields of nano and biotechnologies. Our work deals with the aggregation behavior of polyoxometallates that have been complexed with surfactant chains to form Surface Encapsulated Polyoxometallates (SEPs). Our $(AzoC_6O)_2$ surfactant chains have terminal azobenze groups that can be readily photoisomerized; the accompanying change in dipole moment can cause aggregation or disaggregation, depending on the wavelength of the light and the polarity of the solvent used. In polar solutions, exposure to visible light will convert the terminal azobenzene groups to their trans-configuration, inducing aggregation. Conversely, if exposed to UV light (354 nm) the azobenzene groups will rearrange into the cis-configuration causing the SEPs to redisperse uniformly back into solution. Interestingly, the aggregation behavior of our SEP in non-polar solution is exactly opposite of that in polar solution. The aggregation and disaggregation observed in both cases is reversible and stable over many cycles. In addition to this we have shown, with the use of Nile Red dye, that the aggregates formed in solution are capable of capturing guest molecules.

Nano Sci Poster 7:

Silicon surface pattern arrays for antireflective lenses

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Sub wavelength structures can bend certain frequencies of light and scatter them so that minimal reflectance is achieved. More specifically, conical arrays and pillar-like structures of silver nanoparticles on a silicon substrate have shown excellent antifogging and antireflective properties. By evaporating and heating different layers of silver for different time intervals and temperatures, the size of the nanoparticles can be manipulated. PMMA molds are imprinted onto the sample to form the arrays. Then reactive ion etching can be used to peel away the silver layer, leaving only an array of silicon. The size of the particles is directly related to the size of the nanostructures, and therefore controls the level of reflectance. Our results indicate a direct linear pattern between the temperature and particle size. It can be determined that the larger nanoparticles exhibit significantly lower reflectance than the smaller nanoparticles across the entire spectrum of visible light. We plan on applying this to lenses in order to make them less reflective.

Nanosciences Category

Nano Sci Poster 8:

Synthesis of new molecular gelators for the purpose of ion detection and new structures.

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Recently, a new selective phenolic shiff-base detector was discovered. This detector showed a specific colorimetric response to fluoride and florescence response to cyanide. The goal was to make a gel-based detector with the same properties. To do this, we synthesized the shiff-base with a linker to cholesterol, then tested this with various solvents, methanol, ethanol, toluene, THF, DCM, TCM, to achieve a gel. Unfortunately, the product failed to form a gel with any of the solvents tested. With correct linkers this can be a gel. Additionally, it was discovered that utilizing N,N_0,N_{00}-Tris[3(30-carbamoylamino)-2,20-bipyridyl]-benzene-1,3,5-tricarbonamide derivatives, a hierarchiral structure could be attained that formed fibers , which form the supramolecular gel. We applied this to a basic ALS gelator. We synthesized a tripodal cholesterol based gelator with amide linkers, which was tested in several solvents, pentanol, ethanol, cylcohexane, DMF, to achieve a gel. None of these solvents formed a gel. While a simple $A(LS)_3$ tripodal system is not viable, with appropriate linkers this system could prove to a gelators and open up a new area of supramolecular gel.

Nano Sci Poster 9:

Development of a versatile high capacity solid-state lithium ion battery

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In order to fulfill the increasing energy demand, the development of a versatile and high capacity solid-state battery is essential. The focus of this research is the synthesis of a solid state, mesoporous electrolyte with relatively high conductivity. Several different compositions were explored during the course of the research: A $Li_{.35}$-$La_{.55}$-Ti (LLT) perovskite composition was synthesized using the sol gel method, and was doped with various proportions of Neodymium, Yttrium, Samarium, and Gadolinium. The gels were dried and heated to 450^{o}C to burn off any organics. The resultant materials were calcined at high temperatures ranging from 1000^{o}C 1200^{o}C and were analyzed for density, conductivity, and structure. It was found that the density of the compositions rose from an average of 47% dense at a calcination temperature of 1000^{o}C to 94% dense at 1200^{0}C. XRD analysis of the samples determined that the desired structure of the perovskite materials was achieved. It was concluded by 4-point conductivity testing that the doping of the perovskite LLT structure generally decreased the conductivity of the electrolyte.

Nanosciences Category

Nano Sci Poster 10:

Nanoscale mapping of mechanical properties of biological surfaces using atomic force microscopy

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The mechanical properties of cellular membranes, such as rigidity, can influence biological processes of the cell. Changes in these mechanical properties can be associated with a variety of disease by causing cellular dysfunction. For example, cancer cells have softer, more fluid membranes, allowing them to spread easily throughout the body. The purpose of this project was to further validate scanning probe acceleration microscopy (SPAM), a technique based on tapping mode atomic force microscopy (AFM), which can simultaneously measure topography and mechanical properties of surfaces in solution with high spatial and temporal resolution. A model system of total brain lipid bilayers enriched with different amounts of cholesterol was used, because cholesterol is known to alter bilayer mechanical properties. SPAM uses the tip deflection signal to reconstruct tip-sample forces, while also imaging, from an AFM experiment. The forces contain information about the mechanical properties of the surface. Changes in the rigidity of the bilayers with increasing amounts of cholesterol were observed, which were comparable to numerical simulations of the system.

Nano Sci Poster 11:

Tuning optical properties of nanoparticles and nanostructures for biosensor and biolabel applications

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Nanomaterials have unique optical properties, such as surface plasmon resonance (SPR) or fluorescence, that are distinct from their bulk counterparts. Silver or gold nanoparticles present Surface Plasmon Resonance when a specific frequency of light excites the surface plasmons on the nanoparticles. SPR has applications in biosensors, surface enhanced spectroscopy, and diagnosis and treatment. Certain applications require particular wavelengths of SPR, making necessary the tuning of the SPR property of metal nanoparticles. SPR was tuned in this study by modifying the Ag/Au nanoparticles' size and shape. Moreover, the angle-resolved SPR of Ag films with periodic nanostructures was tuned by varying the Reactive Ion Etching time. The SPR of Au film in biosensor application was experimented through detecting the adsorption of molecules. Aside from SPR-active nanomaterials, two types of fluorescent nanoparticles were studied to optimize their fluorescence intensity for potential applications in biolabeling, imaging, and diagnosis. For dye-polymer (PMMA) nanoparticles, dye concentration and method of embedding versus adsorbing the dye were varied, while UV-irradiation time and pH were varied for Ag nanoclusters on core-shell structured polymer nanoparticles.

Nanosciences Category

Nano Sci Poster 12:
In vitro osteoblast responses induced by *Staphylococcus aureus* internalization

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Recent literature suggests that infection recurrence may stem from intracellular pathogens. Our *in vivo* study confirmed that infected host cells alone could lead to bone infection. *Staphylococcus aureus* (*S. aureus*) is responsible for most bone infections, and it is traditionally regarded as an extracellular pathogen. However, *S. aureus* has the ability to invade and live within other cells. The objective of this study was to determine osteoblast responses upon infection with *S. aureus*. We established an osteoblast-*S. aureus* co-culture model and determined the impact of *S. aureus* internalization on the *in vitro* production of reactive oxygen species (ROS), alkaline phosphatase (ALP), and cytokines. We found that intracellular *S. aureus* could survive for a long time period (*e.g.* one week) within osteoblasts. High levels of O_2^- and H_2O_2 were detected in infected osteoblast cultures a few hours after *S. aureus* internalization; a more significant change in O_2^- was found compared to H_2O_2. These studies further enhance our understanding of intracellular infection and may help us design better strategies (*e.g.* nanomedicine) to prevent or treat infection recurrence.

Nano Sci Poster 13:
Utilizing wrinkling and strain softening in single-walled carbon nanotube networks to detect defects in poly (dimethyl siloxane) films

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Single-walled carbon nanotubes (SWNTs) are tubes of graphite that are normally capped at the ends containing a single cylindrical wall. The applications of thin films of SWNTs for modern electronic applications were investigated. One goal of this project was engineering methods to control and monitor the orientation and interaction dynamics in length sorted SWNT networks, which is a novel research opportunity for contributions to the development of robust, transparent mediums for the detection of matrix defects in composite systems. Another objective of this project was to create an engineered composite using these engineered networks of length sorted SWNTs within a poly (dimethyl siloxane) (PDMS) skin. Some of the samples contained SWNT networks, within the PDMS matrix, may provide support strain, induced elastic deformations resulting in in-plane wrinkling configurations prior to the composite being subjected to external forces until the point of failure. Consequently, this may present a more easily incorporable and reliable component if the SWNTs can withstand external stresses and deformations, while maintaining their functionality.

Nanosciences Category

Nano Sci Poster 14:

Nitrogen-doped Ni@$La_2Ti_2O_7$ as a visible-light photocatalyst for converting carbon dioxide to methane

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There is a growing need to develop a visible, light-driven photocatalyst that can convert CO_2 into usable fuel gas such as methane while reducing CO_2 emissions. $La_2Ti_2O_7$ nanosheets synthesized by the hydrothermal method were used as a photocatalyst to have large surface area, high charge transfer and low charge recombination rate. To optimize the efficiency of the charge transfer and visible light utilization, $La_2Ti_2O_7$ nanosheets were loaded with nickel by the impregnation method and doped with nitrogen by heating in flowing NH_4 (20 sccm). The $La_2Ti_20_7$ nanosheets were 100nm to 1µm in length and 10-15 nm in thickness. After nitrogen doping, the crystal structure of $La_2Ti_20_7$ did not change. The absorption of nitrogen-doped Ni@$La_2Ti_2O_7$ in visible light regime was enhanced. Nitrogen-doped Ni@$La_2Ti_2O_7$ nanosheets were irradiated in blue light (centered at 420 nm) for $C0_2$ conversion and 1-2 ppm of CH_4 was obtained by measurement with Gas Chromatography (GC). Larger quantities of CH_4 are expected to be produced by optimizing the amount of doped nitrogen and concentration of loaded nickel.

Nano Sci Poster 15:

Synthesis and characterization of chloroperoxidase-nanotube conjugates for antibacterial applications

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Synthesizing antibacterial coatings that have the ability to inhibit bacterial attachment or survival is beneficial within environments associated with the transmittance of bacterial diseases. Chloroperoxidase (CPO) uses hydrogen peroxide (H_2O_2) and sodium chloride (NaCl) to generate hypochlorous acid (HOCl), which can oxidize bacteria. The synthesis of CPO-based conjugates offers a possible solution as a potential component for antibacterial coatings. In this work CPO-based conjugates were synthesized by hybridizing free CPO to multi-walled carbon nanotubes (MWNTs) using covalent binding. PEG linkers (of 4.65 nm length) were also employed to reduce any unspecific binding of CPO enzyme to MWNTs. The resulting conjugates were characterized for loading (i.e. amount of enzyme attached) and activity using spectrophotometric assays. Enzyme attachment was also confirmed by atomic force microscopy. The conjugates' bactericidal efficiencies were evaluated by incubation with different concentrations of *E. coli* suspensions. These results and comparisons between CPO-nanotube conjugates and traditional bactericides could lead to a potential component for antibacterial coatings.

Nanosciences Category

Nano Sci Poster 16:

Using ligand exchange to understand the kinetics of surface interactions of superparamagnetic iron oxide nanoparticles

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Superparamagnetic iron oxide nanoparticles (SPIONS) show great promise in biomedical applications as means of targeted drug administration. The study shows the amount of ligand exchange occuring in these systems and the kinetics involved during interactions. A method of dissolving the iron oxide core away will be developed to take nuclear magnetic resonance (NMR) and infrared spectroscopy (IR) of the ligands present on the surface. This dissolving method will allow SPION ligands to be analyzed without interference from the magnetic iron oxide in NMR. The process for ligand exchange replaces the surfactant used in the synthesis with one desired to be bound to the SPION surface. IR and NMR will confirm that the ligand exchange has occurred. The results from this experiment can give insight to using different ligand reactions with SPIONs and to what extent, as well as cut down on experiment lab time and costs. Studying these aspects of the system will make it possible to improve and broaden targeting in drug administration using magnetic nanoparticles.

Nano Sci Poster 17:

Deducing effects of environment on β-cyclodextrin and azobenzene self assembly structures.

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A system of azobenzene and β-cyclodextrin was studied under different conditions in order to investigate self-assembly, morphology, and reversibility. Upon introduction of cyclodextrin and dissolved azobenzene into a water solution, inclusion complexes are self assembled. Different morphologies are observed by changing solution conditions such as percent water volume, azobenzene concentration, urea concentration, or radiation frequency. Under 80% water volume the solution exhibits multiple micrometer long nanowires, but at around 90% water volume nanospheres are observed almost exclusively. Azobenzene exhibits a photoisomerization by ultraviolet irradiation, causing all inclusion complexes to be broken, and no nanowires or spheres are present. A decrease in nanowire length can be attributed to an increase in urea concentration. Characterization of this smart molecule system was performed using TEM, DLS, and UV/Vis absorbance. Possible applications to this research can then be applied to molecular machines such as UV triggered drug delivery, a reversible change in substance properties such as hydrophilicity, or even a reversible surfactant system.

Nanosciences Category

Nano Sci Poster 18:

Methylene blue modulates polyglutamine peptide aggregation

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Polyglutamine diseases are caused by genetically inherited trinucleotide repeat expansions of the CAG triplet. This repeat results in the elongation of a polyglutamine stretch (poly-Q) in a protein. There exists a numerical threshold for these poly-Q stretches that once crossed, results in protein misfolding and subsequent disease, as is the case for Huntington's Disease, where the protein huntingtin (htt) adopts irregular conformations due to abnormal poly-Q length. These conformations then initiate cytotoxic aggregation pathways. Aggregation pathways may be altered by methylene blue (MB), a ligand that may interact with various huntingtin moieties such as the polyproline region (P11) or the N terminus region of htt exon 1 (N17). Four poly-Q peptides with and without huntingtin exon 1 flanking sequences (KKQ35KK, KKN17Q35KK, KKQ35P11KK, KKN17Q35P11KK) were incubated (37°C) and deposited (+/- MB) on mica at 0,1,3,5 and 7 hours. Samples were imaged *ex situ* by tapping mode AFM and analyzed for particle count, volume, height, density, and conformation.

Nano Sci Poster 19:

Characterization of indium gallium nitride multi-quantum well LEDs for biosensing and illumination applications

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Integrated optical sources are essential for numerous applications including next-generation high efficiency lighting, lasers, and integrated optical biosensor detection systems based on whispering gallery modes (WGMs). This work addresses the characterization of light emitting diodes (LEDs) in order to develop integrated sources for next generation applications. Base devices consist of an active layer of InGaN/GaN quantum wells between p and n-type layers of GaN. Peak emission wavelength of 460nm and emission FWHM of 38.2nm are tunable with various mole fractions of indium gallium nitride. Characterization efforts seek to accelerate data processing to obtain a broader representation of device performance over a whole wafer which can be up to 2" in diameter. Specifically designed templates allow for entire photolithography masks to be characterized automatically upon data acquisition. This allows more parameters to be compared across devices than previously possible and leads to a more complete device characterization. Results from batch processing of base and compound LED are in agreement with simulated electrical and optical behavior and will be presented with methodologies developed for extraction of important device parameters.

Nanosciences Category

Nano Sci Poster 20:

Synthesis and characterization of Cu_2ZnSnS_4 and CdSe nanoparticles

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Thin-film solar cells, along with the application of "green chemistry" methods, have the promising possibility of reducing the cost of the construction of solar cells. In this study, we synthesized two compounds, Cu_2ZnSnS_4 (CZTS) and CdSe. Both of these have optoelectronic properties allowing them to act as the semiconducting layer in a solar cell. We individually produced these nanocrystals using the hot injection method. Parameters were altered to observe how the different conditions affected the quality and structure of the nanoparticles. Each sample was characterized, and trends were found with each parameter variation. A few examples of these findings include: n-dodecylthiol being found as a necessary ligand for synthesis in our CZTS system and the size of the nanoparticles increasing as the reaction temperature increased in the CdSe synthesis. By learning more about the properties of these compounds, we are closer to finding the right conditions for both of these materials to be at their top quality. We will be able to create and commercialize high-efficient solar cells at a lower cost while using less energy and materials.

Nano Sci Poster 21:

The longterm antimicrobial effects of self-assembled peptide nanofibers with silver nanoparticles

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Silver nanoparticles are known to posses antimicrobial properties, as such they have been employed in the medical field as antiseptics. However, the use of silver nanoparticles has two major drawbacks that hinder its application as an antiseptic. Upon exposure to light silver nanoparticles form aggregates and lose their antimicrobial characteristics and in large enough concentrations silver is known to be highly toxic leading to a blue discoloration of the skin and liver failure. In order to overcome these problems peptide nanofibers containing numerous carboxylic acids and thiol groups, in this case Fmoc-FFECG, can serve as a lattice to prevent the aggregation of silver nanoparticles. Silver ions bind to both carboxylic acid and thiol groups and are then reduced to form silver-peptide nanofiber nanocomposites that prevent the aggregation of silver nanoparticles in light. This nanocomposite exhibits antibacterial properties against both gram-positive bacteria (B. *subtilis*) and gram-negative bacteria (E. *coli* DH5 α) over an extended period of time without compromising mammalian cells.

Nanosciences Category

Nano Sci Poster 22:

The role of specific amino acid sequences of Aβ on amyloid formation

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A trademark of the neurodegenerative disorder Alzheimer's disease is the presence of neuritic plaques consisting of the beta-amyloid (Aβ) peptide. These deposits form when Aβ misfolds and aggregates into insoluble ordered structures. Such structures primarily consist of oligomers or fibrils, where the conformation of greatest neurotoxicity remains unknown. Furthermore, the physical properties of Aβ vary significantly along the peptide, as it is derived from the transmembrane portion of the amyloid precursor protein. This investigation sought to identify the role specific sequences of Aβ play in aggregation. To accomplish this, various fragments of Aβ were incubated in solution and sampled at precise time intervals. The samples were subsequently imaged *ex-situ* via tapping mode atomic force microscopy. Quantitative image analysis was performed to assess the physical characteristics of aggregates. Preliminary results indicate each fragment formed oligomers and fibrils, but the morphologies amongst these aggregates were subtly different. These experiments represent an important prerequisite to investigating the role these sequences play in the binding of Aβ and its aggregate forms to cellular surfaces.