Summer Undergraduate Research Symposium

Thursday, July 27, 2017
Erickson Alumni Center
West Virginia University

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

WVU SURE, NanoSAFE REU, Chemistry REU, Neuroscience SURI, Cancer Inst SuRP, LSAMP

WestVirginiaUniversity.
OFFICE OF UNDERGRADUATE RESEARCH

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NANOSAFE

Summer Undergraduate Research Symposium 2017
West Virginia University

Thursday July 27, 2017 Erickson Alumni Center, Ruby Grand Hall

I. Approximate Schedule of Events

8:30-8:55 am — Poster Setup ─ *Presenters arrive, register, and put up posters. Presenters must leave Alumni Center by 8:55 am and return during assigned, judged presentation time.*

9:00-11:30 am — Poster judging ─ *Only scheduled presenters & not open to public (all presenters return at 11:30 am).*

11:30 am-12:00 pm — Break/Lunch ─ *Judges and presenters first priority, please.*

12:00-12:30 pm — Welcome and Key Note Speaker ─ *All welcome: parents, research mentors, graduate and undergraduate students, and general public.*

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

12:30-2:30 pm — Poster Presentations ─ *Open to all and concurrent with final poster judging.* ***Judges have preference!***

2:30-3:00 pm — Awards Ceremony, Closing Remarks, and SURE Group Photo

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

3:05 pm — *Post-questionnaires (REU & SURE participants)*

II. Poster Judges

Judge	Affiliation	Category Judging
Eugenia Pena-Yewtukhiw	Plant and Soil Sciences, Davis College, WVU	*Agricultural & Environmental Sciences*
Kevin Daly	Biology, Eberly College, WVU	*Biological Sciences*
Dana Huebert Lima	Biology, Eberly College, WVU	*Biological Sciences*
Thorsten Wuest	Industrial Eng., Statler College, WVU	*Engineering*
Dady Dadyburjor	Chemical Eng., Statler College, WVU	*Engineering*
Tim Nurkiewicz	Physiology & Pharmacology, HSC, WVU	*Health Sciences*
Alice Han	Chemistry, Eberly College, WVU	*Health Sciences*
Qi Zeng	SRF BioNano Research Facilities, WVU	*Nanoscience*
Todd Stueckle	NIOSH	*Nanoscience*
Victoria Sanchez	Pre-Health Office, WVU	*Neuroscience*
Elizabeth Engler-Chiurazzi	Physiology & Pharmacology, HSC, WVU	*Neuroscience*
Grace Lu	Chemistry, Eberly College, WVU	*Physical Sciences*
Jessica Hoover	Chemistry, Eberly College, WVU	*Physical Sciences*
Heather Henderson	Educational Psychology, CEHS, WVU	*Social Sciences & non-STEM*

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!

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III. Undergraduate Participants and Faculty Research Mentors

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

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Emily Ankrom	Physical Sci #10 (9:30 am)	Biochemistry	Waynesburg University	Blake Mertz, Chemistry
Emily Gleco	Health Sci #12 (9:30 am)	Chemistry	University of Scranton	Glen Jackson, Chemistry & Forensics
Elinore Loch	Health Sci #10 (9:30 am)	Biochemistry	Waynesburg University	Stephen Valentine, Chemistry
Connor McCormick	Physical Sci #4 (9:30 am)	Chemistry & Mathematics	St. Vincent College	Fabien Goulay, Chemistry
Megan Nally	Physical Sci #5 (10:30 am)	Chemistry & Pre-Engineering	Bethany College	Carsten Milsmann, Chemistry
Morgan Nyman	Physical Sci #13 (10:30 am)	Biochemistry	Gannon U.	Justin Legleiter, Chemistry
Justin Steets	Physical Sci #1 (10:30 am)	Chemistry	The College of New Jersey	Jessica Hoover, Chemistry
Tanner Yawitz	Physical Sci #14 (9:30 am)	Chemistry	St. Francis U.	Björn Söderberg, Chemistry
Perez Youmbi	Physical Sci #12 (9:30 am)	Chemistry & Mathematics	St. Francis U.	Greg Dudley, Chemistry
Natalie Ziemer	Physical Sci #9 (10:30 am)	Biochemistry	Grove City Coll.	Brian Popp, Chemistry

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

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Ashley Boryczka	Nanoscience #9 (10:30 am)	Chemistry & Biomolec. Sci.	Clarkson University	Nianqiang (Nick) Wu, Mechanical & Aerosp. Eng.
Sarah Foster	Health Sci #4 (9:30 am)	Biochemistry	Allegheny Coll.	Aaron Erdely, NIOSH
Allison Haertter	Nanoscience #4 (9:50 am)	Applied Physics	West Virginia Wesleyan C.	Mikel Holcomb, Physics
Sarah Hejnosz	Nanoscience #6 (9:50 am)	Chemistry	Saint Vincent College	Lisa Holland, Chemistry & Linda Sargent, NIOSH
Brittany Keller	Biological Sci #11 (10:30 am)	Chemistry	Shippensburg University	Slawomir Lukomski, Microbiology, Immunology & Cell Biology
Courtney Kristoff	Nanoscience #1 (10:30 am)	Chemistry	Waynesburg U.	Lisa Holland, Chemistry
Jay Magers	Nanoscience #7 (10:30 am)	Physics	Susquehanna U.	Matt Johnson, Physics
Merrik Malin	Nanoscience #11 (10:30 am)	Electrical Engineering	West Virginia Wesleyan C.	Jeremy Dawson, Electrical Engineering
Kimberly Matsinger	Nanoscience #8 (9:50 am)	Physics	Slippery Rock University	Edward Flagg, Physics

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Shannon Patberg	Physical Sci #11 (10:30 am)	Chemistry	Marietta College	Lisa Holland, Chemistry
James Penney	Nanoscience #12 (9:50 am)	Biomedical Engineering	University of Texas at Dallas	Xueyan Song, Mechanical & Aerosp. Eng.
Katelyn Perroz	Biological Sci #6 (9:30 am)	Chemistry	Allegheny Coll.	Jennifer Gallagher, Biology
Devan Shell	Engineering #1 (10:30 am)	Chemistry	Catawba College	Nianqiang (Nick) Wu, Mechanical & Aerosp. Eng.

C. WVU Summer Undergraduate Research Experiences (SURE) Site (Coordinator/Director: Michelle Richards-Babb and Ken Blemings; Teaching Assistants: Kacee Caster and Amanda Hill)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Amanda Barbarossa	Engineering #2 (9:30 am)	Biomedical Engineering	WVU	Sergiy Yakovenko, Human Performance & Exercise Physiology
Patrick Bayly	Non-STEM #10 (9:30 am)	Painting	WVU	Naijun Zhang, Painting
Steven Black	Engineering #17 (10:30 am)	Petroleum and Natural Gas Engineering	WVU	Kashy Aminian, Petroleum and Natural Gas Eng.
Lynsey Blackburn	Agric & Env Sci #2 (9:30 am)	Environmental Geoscience	WVU	Jonathan Hall, Geography
John Bowling	Non-STEM #6 (9:30 am)	Computer & Electrical Eng.	WVU	Natalia Schmid, Computer Science & Electrical Eng.
Aaron Brake	Physical Sci #6 (9:30 am)	Forensic Chemistry & Chemistry	WVU	Tatiana Trejos, Forensic & Investigative Science
Allyson Brezler	Engineering #16 (9:30 am)	Chemical Engineering	WVU	Fernando Lima, Chemical Eng.
Conner Castle	Engineering #14 (9:30 am)	Mechanical & Aerospace Engineering	WVU	Yu Gu, Mechanical Eng.
Sierra Ciccone	Physical Sci #3 (10:30 am)	Chemistry	WVU	Jessica Hoover, Chemistry
Kiara Cogar	Non-STEM #1 (10:30 am)	Psychology & Political Science	WVU	Natalie Shook, Psychology
Tatiana Crawford	Agric & Env Sci #7 (10:30 am)	Wildlife and Fisheries Resource Management	WVU	Christopher Rota, Wildlife & Fisheries
Lauren Dirkman	Health Sci #7 (10:30 am)	Public Health	WVU	Danielle Davidov, Emergency Medicine
Nicole Fama	Biological Sci #4 (9:30 am)	Biology	WVU	Craig Barrett, Biology
Jonathan Fisk	Biological Sci #10 (9:30 am)	Fisheries and Wildlife Management	WVU	Kyle Hartman, Forestry and Natural Resources

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Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Samuel Gary	Biological Sci #7 (10:30 am)	Biochemistry	WVU	Nik Kovinich, Plant & Soil Sciences
John (Drew) Gatlin	Engineering #8 (9:30 am)	Civil Engineering	WVU	Dimitra Pyrialakou, Civil & Environmental Eng.
Sydney Giles	Physical Sci #8 (9:30 am)	Chemistry	WVU	James Lewis, Physics
Emilee Hough	Non-STEM #9 (10:30 am)	English & Sociology	WVU	Kirk Hazen, English
Gregory Hughes	Engineering #13 (10:30 am)	Computer Science	WVU Tech	Powsiri Klinkhachorn, Computer Science and Electrical Eng.
Samantha Isaac	Nanoscience #2 (9:50 am)	Physics & Mathematics	WVU	Edward Flagg, Physics & Astronomy
Andrew Jemiolo	Physical Sci #2 (9:30 am)	Physics	WVU	Earl Scime, Physics
Katelyn Kosar	Engineering #4 (9:30 am)	Civil Engineering	WVU	Leslie Hopkinson, Civil Engineering
Soofia Lateef	Agric & Env Sci #5 (10:30 am)	Chemical Engineering	WVU	Janet Tou, Animal & Nutritional Sciences
Caroline Leadmon	Biological Sci #1 (10:30 am)	Biochemistry	WVU	Dan Panaccione, Plant & Soil Sciences
Michael Lee	Engineering #15 (10:30 am)	Aerospace Engineering	WVU	Jason Gross, Mechanical & Aerospace Eng.
Oliver Lin	Agric & Env Sci #4 (9:30 am)	Biomedical Engineering	WVU	Lian-Shin Lin, Civil & Environmental Eng.
Mykal Manswell	Non-STEM #2 (9:30 am)	Sport and Exercise Psychology	WVU	Scott Barnicle, Physical Activity & Sport Sciences
Natalie Marquart	Non-STEM #4 (9:30 am)	Marketing	WVU	M. Paula Fitzgerald, Marketing
Elizabeth Matejczyk	Agric & Env Sci #3 (10:30 am)	Wildlife and Fisheries Resources	WVU	Christopher Lituma, Wildlife & Fisheries Resources
Morgan Menke	Engineering #5 (10:30 am)	Electrical Engineering & Biometric Systems	WVU	Natalia Schmid, Computer Science & Electrical Eng.
Callie Moles	Agric & Env Sci #6 (9:30 am)	Agricultural and Extension Education	WVU	Jessica Blythe, Agricultural & Extension Education
Karagan Mulhall	Nanoscience #3 (10:30 am)	Immunology and Medical Microbiology	WVU	Steve Leonard, Pharmacy & NIOSH
Jacob Rabel	Agric & Env Sci #9 (10:30 am)	Agriculture & Extension Education	WVU	Jason McKibben, Agricultural & Extension Education
Ali Ranjbaran	Biological Sci #5 (10:30 am)	Biology	WVU	Craig Barrett, Biology

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Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Elizabeth Ridgeway	Engineering #11 (10:30 am)	Mechanical & Aerospace Engineering	WVU	V'yacheslav Akkerman, Mechanical & Aerospace Eng.
Abigail Rosiello	Biological Sci #2 (9:30 am)	Immunology and Medical Microbiology	WVU	Jennifer Hawkins, Biology
Elizabeth Satterfield	Non-STEM #7 (10:30 am)	History	WVU	Jenny Boulware, History
Megan Schmitz	Engineering #3 (10:30 am)	Mechanical engineering	WVU	Ed Sabolsky, Mechanical & Aerospace Eng.
Timothy Scott	Engineering #9 (10:30 am)	Computer Science, Computer and Electrical Eng.	WVU	Gianfranco Doretto, Computer Science & Electrical Eng.
Rebekah Shephard	Neuroscience #4 (9:30 am)	Biology	WVU	Sadie Bergeron, Biology
Jacqueline Spiropoulos	Non-STEM #3 (10:30 am)	Sociology	WVU	Susanna Donaldson, Sociology & Anthropology
Andrew Steele	Neuroscience #5 (10:30 am)	Biology	WVU	Andrew Dacks, Biology
Patrick Thomas	Health Sci #9 (10:30 am)	Biochemistry	WVU	Laura Gibson, Microbiology, Immunology & Cell Biology
Shannon Underwood	Non-STEM #8 (9:30 am)	Psychology	WVU	Aaron Metzger, Psychology
Rachel Wattick	Health Sci #5 (10:30 am)	Human Nutrition and Foods	WVU	Melissa Olfert, Animal & Nutritional Sciences
Isaac Willis	Physical Sci #7 (10:30 am)	Forensic and Investigative Science & Chemistry	WVU	Glen Jackson, Chemistry & Forensic & Investigative Sciences
Daniel Wolodkin	Agric & Env Sci #8 (9:30 am)	Biology & Mathematics	WVU	Jonathan Cumming, Biology
Steven Wu	Health Sci #1 (10:30 am)	Biology	WVU	Yon Rojanasakul, Pharmaceutical Sciences
Bennett Yunker	Biological Sci #9 (10:30 am)	Biochemistry	WVU	Teiya Kijimoto, Evolutionary Developmental Genetics
Victoria Zeger	Health Sci #8 (9:30 am)	Forensic Chemistry & Chemistry	WVU	Suzanne Bell, Chemistry

D. WVU Summer Undergraduate Research Experiences (SURE) Site (Participants funded for participation by other mechanisms.)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
[b]Jonathan Bard	Biological Sci #14 (9:30 am)	Biochemistry	WVU	Justin Legleiter, Chemistry
[a]Brittany Brush	Engineering #10 (9:30 am)	Geology	WVU	Omar Abdul-Aziz, Civil & Environmental Eng.
[c]Nathan Burks	Non-STEM #5 (10:30 am)	Finance & Economics	WVU	Bingxin Li, Finance
[d]Zoe Dobler	Neuroscience #1 (10:30 am)	Biology	WVU	Sadie Bergeron, Biology
[e]Anna Eden	Health Sci #13 (10:30 am)	Biomedical Engineering	WVU	Cerasela-Zoica Dinu, Chemical & Biomedical Eng.
[b]Caleb Fan	Biological Sci #13 (10:30 am)	Biochemistry	WVU	Justin Legleiter, Chemistry
[c]Yacine Feliachi	Engineering #7 (10:30 am)	Chemical Engineering	WVU	Fernando Lima, Chemical and Biomedical Eng.
[c]Landon Hall	Nanoscience #10 (9:50 am)	Chemical Engineering	WVU	Charter Stinespring, Chemical Eng.
[a]Miguel Henriquez	Physical Sci #15 (10:30 am)	Physics	WVU	Earl Scime, Physics
[b]Noor Malik	Biological Sci #8 (9:30 am)		WVU	Jennifer Gallagher, Biology
[b]Alex Rubenstein	Agric & Env Sci #1 (10:30 am)	Biomedical Engineering & Mathematics	WVU	Lian-Shin Lin, Civil & Environmental Eng.
[c]Olivia Santee	Engineering #6 (9:30 am)	Mechanical Engineering	WVU	James Smith, Mechanical & Aerospace Eng.
[d]Aishwarya Vijay	Health Sci #6 (9:30 am)	Biomedical Engineering	WVU	Cerasela-Zoica Dinu, Chemical & Biomedical Eng.
[c]Kenneth Williams	Nanoscience #5 (10:30 am)	Biomedical Engineering	WVU	Cerasela-Zoica Dinu, Chemical & Biomedical Eng.

[a]Funded by an NSF Louis Stokes Alliance for Minority Participation (LSAMP) KY-WV Mid-Level Alliance Phase II (LSAMP-1305039; WV PI: David Miller).
[b]Funded through faculty grants to Justin Legleiter (NIH grant, R15NS090380), Jennifer Gallagher, and Lian-Shin Lin.
[c]Funded by the West Virginia University Energy Institute (Director: Brian Anderson)
[d]Funded partially by faculty grants or faculty overhead.
[e]Funded by use of academic enhancement stipend as part of student's University Merit Scholarship.

E. Center for Neuroscience Summer Undergraduate Research Internships (SURI) (PI: George Spirou; Administrator: Erica Stewart)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Lindsay Fadel	Neuroscience #3 (10:30 am)	Neuroscience	High Point University	Sadie Bergeron, Biology
Karianne Sretavan Wong	Neuroscience #6 (9:30 am)	Neuroscience	University of Rochester	Julie Brefczynski-Lewis, Physiology & Pharmacology
Hana Ulman	Neuroscience #2 (9:30 am)	Biomedical Engineering	WVU	Candice Brown, Neurobiology & Anatomy
Reid Strobl	Neuroscience #13 (10:30 am)	Biology w/ Neuroscience emphasis	WVU	Andrew Dacks, Biology
Brian Donaldson	Neuroscience #12 (9:30 am)	Chemical Engineering	WVU	Valeriya Gritsenko, Human Performance & Physical Therapy
Emily Silvestri	Neuroscience #11 (10:30 am)	Neuroscience	University of New Hampshire	Steven Kinsey, Psychology
Janelle Chuah	Health Sci #15 (10:30 am)	Biology - Pre-Medical	Waynesburg University	Paul Lockman, Pharmaceutical Sciences
Olivia Hill	Neuroscience #10 (9:30 am)	Exercise Physiology	WVU	Gary Marsat, Biology
Edward Provencher	Neuroscience #9 (10:30 am)	Biochemistry & Molecular Biology	University of Richmond	Xuefang (Sophie) Ren, Physiology & Pharmacology
Jawuanna McAllister	Neuroscience #8 (9:30 am)	Biomedical Sciences	North Carolina Wesleyan College	Eric Tucker, Neurobiology & Anatomy
Kristen Pechacek	Neuroscience #7 (10:30 am)	Psychology & Neuroscience	St. Catherine University	Cole Vonder Haar, Psychology
Abby Williamson	Engineering #12 (9:30 am)	Biomedical Engineering	University of Rochester	Sergiy Yakovenko, Human Performance & Exercise Physiology

F. Immunology and Medical Microbiology Research Internships (Director: John Barnett)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Courtney Amend	Health Sci #14 (9:30 am)	Immunology and Medical Microbiology	WVU	Edwin Wan, Microbiology, Immunology & Cell Biology
Osa Benjy-Osarenkhoe	Health Sci #3 (10:30 am)	Immunology and Medical Microbiology	WVU	John Barnett, Microbiology, Immunology & Cell Biology
Kaltume Ndyako	Health Sci #2 (9:30 am)	Immunology and Medical Microbiology	WVU	Duaa Dakhlallah, Microbiology, Immunology & Cell Biology
Andrea Pettit	Health Sci #11 (10:30 am)	Immunology and Medical Microbiology	WVU	Jennifer Franko, Microbiology, Immunology & Cell Biology

G. WVU Cancer Institute Summer Undergraduate Research Program (Coordinator: Alexey Ivanov)

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Emmanuel Chan	Biological Sci #12 (9:30 am)	Molecular Cell Biology & Psychology	University of California - Berkeley	Patrick Ma, Medicine
River Hames	Health Sci #16 (9:30 am)	Biology	WVU	Scott Weed, Biochemistry

H. Self-funded or Faculty-funded

Participant	Poster (Judged Time)	Major	Home School	Faculty Mentor
Ariana Newton	Agric & Env Sci #10 (9:30 am)	Horticulture	WVU	Nicole Waterland, Horticulture
Nanda Siva	Neuroscience #14 (9:30 am)	Biomedical Engineering & Economics	WVU	Julie Brefczynski-Lewis, Physiology & Pharmacology
Trinity Shaver	Neuroscience #15 (10:30 am)	Psychology	WVU	Cole Vonder Haar, Behavioral Neuroscience
Jessi Tyo	Biological Sci #3 (10:30 am)	Biochemistry	WVU	Daniel Panaccione, Plant & Soil Sciences

IV. Speakers at REU/SURE Events

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

Speaker	Affiliation	Group(s)	Topic
Leigh Pratt	ASPIRE Office, WVU	SURE	NSF Graduate Research Fellowship
Chanelle Pickens	Evansdale Library	SURE	Research Question Formulation
Nathalie Singh-Corcoran	Writing Studio, WVU	SURE	Technical Writing: Ethics, Clarity, and Cohesion
Maja Husar Holmes	Public Admin, WVU	SURE	Science & Public Policy
Ed Sabolsky, Marjorie Darrah, Amy Welsh, and Carrie White	WVU Faculty/Staff	SURE	Work in Academia vs. non-Acad.
Victoria Sanchez, Jessie Barclay & Jessica Johnston	Pre-Health & Career Services, WVU	SURE	Interview Simulations & Resume Feedback
Shelly Stump	WVU Office of Graduate Admissions & Recruiting	REU & SURE	Ice Cream Social & Graduate Recruitment Networking Event
Brian Popp	Chemistry, WVU	REU & SURE	ChemDraw Training & NMR Intro
Carsten Milsmann	Chemistry, WVU	REU	Intro to EPR
Justin Legleiter	Chemistry, WVU	REU & SURE	Graduate Recruit. & STM/AFM
Jeff Petersen	Chemistry, WVU	REU	Crystallography Intro
Stephen Valentine	Chemistry, WVU	REU & SURE	Intro to Mass Spec
Casey Jelsema	Statistics, WVU	SURE	Intro to Statistics for Research
Gabe Tapia	McNair Scholars Program	SURE	The Art of Research Writing
Kim Quedado	IGERT Project Manag.	REU & SURE	Morgantown Kids Day
Peter Willis	NASA, JPL, Caltech	REU & SURE	Career Mentoring

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?

Honors College: http://www.honors.wvu.edu/
Chemistry REU: http://undergraduateresearch.wvu.edu/reu-site-research-in-chemistry-at-wvu
Nano REU: http://research.wvu.edu/researchers/nanosafe/nano-reu
WVU SURE: http://undergraduateresearch.wvu.edu/summer-undergraduate-research-experience
Community Engagement in Science Through Art (CESTA): http://www.cestaprogram.com/
WVU Cancer Institute Summer Undergraduate Research Program: http://wvucancer.org/education/undergraduate/
WVU Center for Neuroscience SURI: http://neuroscience.wvu.edu/training-and-internships/suri
Office of Undergraduate Research: http://undergraduateresearch.wvu.edu/
NanoSAFE: https://research.wvu.edu/researchers/nanosafe

VI. Acknowledgements

A. Personnel

Chemistry REU
Michelle Richards-Babb, PI
Brian Popp, co-PI
Steve Knowlden, Asst. to REU Director

WVU SURE
Michelle Richards-Babb, Director/Educ. Coord.
Kacee Caster, Teaching Assistant
Amanda Hill, Teaching Assistant
Hellen Nditsi, Office of UG Research, Coord.
Kim Quedado, Assistant to Director
Ken Blemings, Honors College Dean

Nano REU
Lisa Holland, PI
Kim Quedado, co-PI
Rachel Henderson, Asst. to REU Director

Symposium Booklet
Michelle Richards-Babb
Hellen Nditsi
Kacee Caster
Amanda Hill

B. Financial Support

Chemistry REU (PI: Michelle Richards-Babb, co-PI: Brian Popp)
National Science Foundation (NSF) Division of Chemistry (CHE 1559654) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.

Nano REU (PI: Lisa Holland, co-PI: Kim Quedado)
National Science Foundation (NSF) Divisions of Materials Research and Chemistry (DMR 1559880) with recreational activities funded by WVU Research Corporation and the WVU Eberly College of Arts and Sciences.

WVU SURE (PI: Michelle Richards-Babb & Ken Blemings)
Sponsored in part by (i) the West Virginia Research Challenge Fund through a grant from the Division of Science and Research, HEPC, (ii) WVU Office of the Provost, and (iii) the Davis College of Agriculture, Forestry and Consumer Sciences, Eberly College of Arts and Sciences, the Statler College of Engineering and Mineral Resources, the College of Business and Economics, the Health Sciences Center, the Colleges of Creative Arts and Physical Activity and Sports Sciences, and the Departments of Chemistry and Biology.

WVU Cancer Institute Summer Undergraduate Research Program (Coord: Alexey Ivanov)
Financial support for the fellowship program comes from the Edwin C. Spurlock Fellowship Fund, the Edward L. Reed Cancer Research Endowment, the Dr. David B. McClung Cancer Research Endowment Fund, and the Joe Marconi Cancer Research Fellowship Endowment.

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

LSAMP KY-WV Mid-Level Alliance (WV PI: David Miller)
Stipends and tuition for two SURE participants were funded through the NSF Louis Stokes Alliance for Minority Participation (LSAMP) KY-WV Mid-Level Alliance Phase II (LSAMP-1305039).

Agricultural and Environmental Sciences Category

Ag & Env Sci Index:

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 1:

Acid mine drainage coated sand as a soil amendment and phosphate removal system

Alex Rubenstein, Karen Buzby and Lian-Shin Lin
Department of Civil and Environmental Engineering
West Virginia University, Morgantown, WV 26506

Acid mine drainage (AMD), a water pollutant due to coal mining, is caused by introducing sulfides to air and water from the surrounding rocks, forming sulfuric acid. Due to the highly acidic quality of the water, metals and toxic compounds are dissolved from surrounding surfaces into the stream. We developed a method to selectively extract metals from AMD and use them in coating sand particles to generate a sorbent for phosphate removal from various nutrient-laden wastes. We implemented phosphate saturated coated sand as a soil amendment to study tomato plant growth. Using atomic absorption spectroscopy and colorimetric methods, low concentrations of iron, aluminum, and phosphate were observed in plant leachate, or runoff, after applications of fertilizer. As compared to conventional sand, plants grown in AMD coated sand showed slightly reduced growth, but successfully utilized phosphate from the experimental medium for growth. These results demonstrate AMD coated sand as a nutrient delivery system and soil amendment with minimal negative impact to plant growth.

Ag & Env Sci Poster 2:

Analysis of fledging success from home range characteristics of breeding California Condors

Lynsey Blackburn and Jonathan Hall
Department of Geology and Geography, Eberly College of Arts and Sciences West Virginia University, Morgantown, WV 26506-6045

The critically endangered California Condor (*Gymnogyps californianus)* has been a conservation success story since their near extinction in the early 1980's. However, threats such as lead poisoning, microtrash ingestion and habitat loss prevent wild Condors from sustaining viable populations without human conservation efforts. The slow reproductive rate of this species has caused high fledgling mortality to have a disproportionately large impact on population growth. Despite known risk factors to nestlings, there lacks a keen understanding of the spatio-temporal factors that influence fledging success beyond acute mortality events such as predation, microtrash ingestion, disease, or injury. In this study, we used data from GSM GPS telemetry units attached to breeding condors from 2014 to 2016 to determine spatio-temporal differences between characteristics of nests that fledged a chick and nests that did not. Our preliminary results showed that several nest site characteristics differed significantly between successful nests and non-successful nests. Our findings will provide novel insight into condor nesting and serve as the foundation for a predictive model that will aid in condor nest site management.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 3:

Forest management effects on Cerulean Warbler populations in West Virginia

Elizabeth A. Matejczyk, Christopher M. Lituma and Christopher Rota
Davis College of Agriculture, Natural Resources and Design
Wildlife and Fisheries Resources, West Virginia University, Morgantown, WV 26506

The Cerulean Warbler (*Setophaga cerulea*) has been a species of concern for several years due to habitat loss and climate fluctuations. Literature confirms this species requires canopy gaps in oak forests. Forest enhancement techniques, including tree falls, increase biodiversity when appropriately applied. My objective was to monitor success of forest management practices via avian point counts, on 14 plots of private land. Vegetation variables were collected to determine habitat characteristics in relation to avian species occurrence. I hypothesized that managed forests would contain more Cerulean Warblers compared to unmanaged forests. Untreated forests had an average occurrence of 0.7 (n = 14, SD = 1.3) compared to 1.8 (n = 14, SD = 2.5) in treated forests, supporting my hypothesis. These practices require constant maintenance to preserve habitat integrity. Perhaps more time is needed to allow Cerulean Warblers to establish in new habitat; it may take several seasons to see populations grow. For now, this data can inform forest management practice improvements for the Cerulean Warbler Forest Enhancement Project and future studies involving the Cerulean Warbler.

Ag & Env Sci Poster 4:

Elucidation of reaction kinetics in novel ferric-dosed wastewater treatment technology

Oliver Lin, Musfique Ahmed and Lian-Shin Lin
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West Virginia University, Morgantown, WV 26506

With a global push towards sustainable technology, there is an increased demand for innovative industrial systems that conserve energy and limit environmental impact. The novel wastewater treatment technology we propose is a ferric-dosed, anaerobic treatment system that fosters the growth of iron and sulfur-reducing bacteria to treat wastewater. This system addresses both core issues by eliminating the need for biological aeration, which is associated with 50-75% of the total electrical consumption in an aerobic treatment plants and the main contributor to the production of CO_2 during organics oxidation. This study focuses on the kinetics and mechanisms occurring in model bioreactors dosed with ferric and organic compounds representative of municipal wastewater. Chemical oxygen demand (COD) analysis of samples collected at specific time points supports the assertion of ferric and sulfate reduction occurring within the reactor. Further evidence is provided by increasing levels of ferrous iron and sulfide compounds in the effluent water. This trend holds true for varying ratios of iron and sulfur compounds as well as total organic levels in the influent wastewater.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 5:

Liver lipid metabolism changes from feeding apple pomace to female Sprague-Dawley rats

Soofia Lateef, R. Chris Skinner and Janet Tou
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Apple pomace is waste byproduct of apple processing that is environmentally toxic and expensive to dispose of properly. Its high antioxidant content gives it potential as a dietary supplement, but its fructose content may promote fatty liver disease. The project objective was to determine the effect of apple pomace on liver lipid metabolism. Young (22-28 day old) female Sprague-Dawley rats (n=8 animals/group) were randomly assigned standard or Western (high fat/sugar) diets with or without apple pomace supplementation (10% of kcal). It was hypothesized apple pomace would not promote fatty liver disease in either diet. After 8 weeks, livers were collected and lipid metabolism was analyzed. Methods used were histology and measurement of lipolysis and lipogenesis gene expression. Histology showed apple pomace in the standard diet increased fat deposition, but in the Western diet it caused a decrease. Lipid metabolism gene expression measurement is currently ongoing and will provide more precise data. This work will show if apple pomace in human diets could have positive impacts on the environment, apple industry, and human health.

Ag & Env Sci Poster 6:

An examination of the questioning habits of pre-service teachers before and after instruction and experience

Callie Moles and Jessica M. Blythe
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Questioning is one of the most prominent teaching methods and is utilized regardless of grade level or subject area. Effective questioning habits of teachers can greatly impact student achievement by causing students to analyze and evaluate, rather than simply memorize and regurgitate information. The study aims to investigate changes in questioning habit that occur with instruction and experience. In this study, lesson plans from an Agricultural Education teacher education course at West Virginia University were analyzed. Each question was classified to reflect the impact on student learning. Data was evaluated with descriptive statistics and matched t-tests to examine how the pre-service teacher questioning habits developed over time. The results showed quantity of teacher questions changed very little during the semester; however, there was a positive significant difference in the quality of questions following instruction and experience. The study recommends pre-service teachers receive focused instruction on questioning followed by practice implementing the technique. Teacher educators should continue to encourage students to incorporate questioning into their instruction to continue to develop their skill.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 7:

The future of high elevation birds in the Appalachian Mountains

Tatiana R. Crawford, Gordon Dimmig and Christopher Rota
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As climate change becomes a more common topic in wildlife conservation, I wanted to see the effects of this phenomenon on the birds of the Appalachian Mountains. Birds are optimal for this study because they are creatures with very specific niches and preferences. This summer I have been traveling the Appalachian Mountains collecting research on birds and their preferred elevations. With this research, along with twenty years' worth of research granted to us by the parks service, I hope to show change in the elevation niches of the birds in the Appalachian Mountains. Out of all the species collected I hope to choose four to focus on. My focus will be on the two with the highest average elevation preference and the two with the lowest average elevation preference. I will then track these species through the twenty years of research gathered and document their elevational changes. With this information we can track the rate of change in these species and predict future elevation changes and, unfortunately, the loss of species in the Appalachian Mountains.

Ag & Env Sci Poster 8:

Assessment of aluminum tolerance in Salix spp. for biomass production and reclamation of disturbed lands

Daniel S. Wolodkin, Tyler J. Davidson and Jonathan R. Cumming
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Short rotation woody production systems can be used to produce biofuels on marginal soils to avoid competition for arable lands. These soils can be found within abandoned and reclaimed mines throughout Appalachia. Mine soils often contain acidic soil which holds aluminum. contains acid producing minerals that release aluminum and other toxic metals. Aluminum acts as a phytotoxin by limiting root growth and causing nutrient deficiencies. Sixteen different lineages of Salix were evaluated in a hydroponic setup with various concentrations of aluminum. Biomass was measured and the roots were evaluated for aluminum concentration. Three divergent lineages were further examined: Oneida, which is resistant to aluminum; Fabius, which grows well; and 94006, which is sensitive to aluminum. Cuttings of these lineages were grown in either 0 or 100 µM aluminum in the hydroponic system. Rooted cuttings were harvested after 8 hours, 72 hours, and 14 days of exposure. The samples will be evaluated for root and shoot Al concentration, as well as organic acid exudation by root systems, which is a mechanism of aluminum resistance.

Agricultural and Environmental Sciences Category

Ag & Env Sci Poster 9:

The occurrence of agriculture mechanics research

Jacob K. Rabel and Jason McKibben
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A common problem for graduate students in agriculture education is finding a thesis project that can be valued in the advancement of their career. If graduate students could find spaces of research in a specific area then it would be more efficient for a thesis to be selected. This study focuses specifically on existing agriculture mechanics research conducted between 1980 and 2017. This study produced six themes of research in agriculture mechanics research and the amount that each theme is researched within this thirty-seven-year window. This study will give graduate students in agriculture education an idea of the research that already exists and how they can contribute to new research. It should be understood that this type of study should be conducted within all areas of agriculture education so we may have a better understanding of the occurrence of research within this discipline.

Ag & Env Sci Poster 10:

Biological control of whiteflies (*Aleyrodidae* family) using carnivorous plants (*Drosera spp.*)

Ariana R. Newton, Youyoun Moon and Nicole L. Waterland
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As consumer demand for environmentally conscious and reduced pesticide practices increases, it becomes more important to look towards alternative pest control options. One option is to use biological controls. In this experiment, we examined carnivorous plants as a means of biological control to manage whitefly population in a greenhouse. Two carnivorous plant species were used; thread-leaved sundew (*Drosera filiformis*) and Cape sundew (*Drosera capensis*). One carnivorous plant was placed in each insect cage with 40 whiteflies along with nine tomato plants for insect feeding. The number of whiteflies caught by each carnivorous plant species over the course of three weeks was measured. This measurement was compared to the number of whiteflies caught by insect sticky cards. Due to the surface area differences among treatments, the number of whiteflies caught per area was calculated. Thread-leaved sundew was the most effective at 0.25 whiteflies caught per cm^2. Cape sundews and the sticky cards captured 0.14 and 0.17 whiteflies per cm^2, respectively. The results indicate that thread-leaved sundews could be utilized to manage whiteflies in a greenhouse setting.

Biological Sciences Category

Biological Sciences Index:

Biological Sciences Category

Bio Sci Poster 1:

Ergot alkaloids in bioactive *Metarhizium* species fungi

Caroline E. Leadmon and Daniel G. Panaccione
Division of Plant and Soil Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, Morgantown, WV 26505

Fungi in the genus *Metarhizium* have recently been discovered to have the genetic capacity to produce lysergic acid-derived ergot alkaloids. *Metarhizium* species are known to be natural insecticides; however, production of ergot alkaloids in insects has yet to be connected with insect fatality. Production of ergot alkaloids appears to be tightly regulated. We grew *Metarhizium* species on different media and in inoculated insects, and found that alkaloid accumulation depended on fungus species, growth medium, and method of inoculation into insects. To investigate the role of these chemicals in insect pathogenesis we are taking a gene knockout approach. The gene *dmaW* is known in other fungi to be the first gene in the ergot alkaloid pathway; thus it was selected as our target gene because eliminating it should prevent all production of ergot alkaloids. We are creating the dmaW gene knock-out by replacing the target gene with the gene conferring resistance to hygromycin, an antibiotic. Understanding ergot alkaloids in *Metarhizium* species fungi may lead to better strategies for biocontrol of insects.

Bio Sci Poster 2:

Elevated nitrogen shifts microbial community structure and function in forest soils

Abby Rosiello, Ashley Henderson, Joseph Carrara, Rajanikanth Govindarajulu, Edward Brzostek and Jennifer Hawkins
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Atmospheric nitrogen deposition owing to the burning of fossil fuels has enhanced the storage of carbon in soils. The role that soil microbial communities play in this process is important but not well understood. In this project, two distinct forest sites (Bear Brook, Maine, and Fernow, West Virginia) that have undergone similar long-term nitrogen fertilization treatments were used to study how soil microbes respond to elevated nitrogen. DNA and RNA were extracted and sequenced from three soil layers (bulk, organic horizon, and rhizosphere) to determine the structure and function of the associated microbial communities. Preliminary metatranscriptomic results show both decreases and increases in transcriptional activity for most major fungi and bacteria under elevated nitrogen, suggesting that elevated N alters microbial activity. It is expected that shifts in microbial community structure will reflect these changes in transcriptional activity. Collectively, these results indicate that shifts in microbial community activity due to N deposition are a dominant driver of greater soil carbon sequestration, and may therefore provide findings that can be used in diverse settings, such as agriculture.

Biological Sciences Category

Bio Sci Poster 3:

Functional analysis of a gene involved in synthesis of fungal lysergic acid amides

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Ergot alkaloids are chemicals that are produced by certain fungi and are important in agriculture and medicine. Many important ergot alkaloids are lysergic acid amides, such as ergonovine and lysergic acid alpha-hydroxyethylamide (LAH). The pathway to create ergonovine is established, but the pathway from ergonovine to LAH is unknown. Based on genome sequence comparisons we hypothesized that a FAD monooxygenase gene (*easO*) was involved in the production of LAH from ergonovine. Using PCR methods, we prepared a gene knock out construct and introduced it into the LAH-producing fungus *Metarhizium anisopliae* by protoplast transformation. Four independent knock outs were identified by PCR strategies that showed the knock-out construct had integrated into the *easO* locus. High performance liquid chromatography (HPLC) analysis demonstrated that the knock-out fungal strains lacked LAH and retained ergonovine. The data supported our hypothesis that *easO* was involved in the production of LAH from ergonovine. An understanding of the production of lysergic acid amides is beneficial because of the medical purposes of lysergic acid derivatives.

Bio Sci Poster 4:

Genetic diversity and morphological variation in a vulnerable WV native orchid, *Corallorhiza bentleyi*

Nicole Fama, Brandon Sinn and Craig Barrett
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Corallorhiza bentleyi is a rare orchid species endemic to five counties along the West Virginia/Virginia border. This recently described species has approximately 10 populations, and is both geographically restricted and locally rare. More research is needed to characterize the genetic diversity the orchid requires for long-term survival. We took a three-fold approach to quantify diversity among populations of *Corallorhiza bentleyi*. First, microsatellite markers were developed to identify length polymorphisms within *C. bentleyi*. Fungal host DNA was amplified and sequenced to quantify the degree of specificity towards the orchid's ectomycorrhizal fungal hosts. Finally, morphological diversity was analyzed with principal components analysis by measuring sizes of flower parts from different individuals. It is expected that, due to small populations sizes, reliance on self-pollination, and reliance on one species as a fungal host, that genetic diversity will be low among populations. The goal of this research is to obtain more information concerning genetic diversity, relationships with its fungal host, and environmental requirements in order to influence management *C. bentleyi* populations and their habitats in southern Appalachia.

Biological Sciences Category

Bio Sci Poster 5:

Mitochondrial DNA evolution in mycoheterotrophic orchid *Hexalectris*

Ali Ranjbaran, Brandon Sinn and Craig Barrett
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Mycoheterotrophs are a group of plants that parasitize fungi. Partial mycoheterotrophs can still carry out photosynthesis, while others—holomycotrophs—have lost this ability. About half of all mycoheterotrophs are orchids; mycoheterotrophy has evolved >30 times independently in orchids. Heterotrophy in plants is often associated with increased DNA substitution rates, i.e. an increase in the number of DNA mutations over time. Despite the increasing number of plastid genomes being sequenced, there is still little known about mutational processes in the mitochondrial genome. Yet, these genomes hold potential to serve as models for understanding of mutational processes and genome evolution in plants. The 4 main objectives are to: 1) use mitochondrial DNA to compare substitution rates between partial mycoheterotrophic and holomycoheterotrophic species in two North American orchid genera containing both nutritional strategies, *Hexalectris* and *Corallorhiza* ; 2) determine relationships based on mitochondrial and plastid DNA; 3) compare substitution rates in *Hexalectris* (~30 million years old) to a relatively younger *Corallorhiza* (~3 million yrs old); 4) work towards constructing the first nearly complete mitogenome of any orchid or mycoheterotrophic plant. We observe higher rates of genetic change in holomycotrophic species of *Hexalectris* in mtDNA, and in part in *Corallorhiza*. As we hypothesized, *Hexalectris* showed higher overall mitochondrial substitution rates compared to the younger *Corallorhiza.* This study helped us to get closer to constructing a mitogenome for MH, and have a better understanding on the effects of altered natural selection regimes associated with drastic shift in nutritional mode on genome evolution.

Bio Sci Poster 6:

Characterization of the role of arrestin proteins in response to cellulosic copper nanoparticles in *Saccharomyces cerevisiae*

Katelyn R. Perroz[1,2] and Jen Gallagher[1]
[1]Department of Biology, Eberly College of Arts and Sciences, West Virginia University, Morgantown, WV 26506 and [2]Department of Biochemistry, Allegheny College, Meadville, PA 16335

Copper antimicrobial materials generate reactive oxygen species which are effective against both bacteria and fungi, however copper is expensive and not biodegradable. Copper nanoparticles built on cellulose (c-CuNPs), are low-cost, biodegradable, and deliver copper in an efficient and controlled manner. Yeast, unlike bacteria, are eukaryotes with similar biochemical pathways to humans, making it difficult to design antifungal materials with low toxicity to humans. Previous studies found c-CuNPs decorating the outside of yeast cells and were believed to be too small to enter the cells through channels, but about 10% of the cells had c-CuNPs inside the cells. Large molecules and membrane bound proteins enter eukaryotic cells through the process of endocytosis. Endocytosis requires a class of proteins called arrestins to trigger the endocytosis of different cargos. To investigate how c-CuNPs are entering yeast, different arrestin mutants of yeast were treated with c-CuNPs. A subset of these arrestins do have a role in endocytosis of c-CuNPs into yeast cells. This research supports the use of nanotechnology to make copper antimicrobial compounds to improve public safety.

Biological Sciences Category

Bio Sci Poster 7:

Novel apigenin and genkwanin derivatives as potential cancer growth inhibitors

Samuel L. Gary and Nik Kovinich
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The naturally occurring flavones apigenin and genkwanin have gained notoriety in recent years as effective antiproliferative compounds, highly selective to cancerous cells, but are not potent enough to provide a rational clinical use. In the present study, novel halogenated derivatives of apigenin and genkwanin were produced in attempt to increase the efficacy of anticancer activity of these compounds. *N*-Bromosuccinimide was used to brominate apigenin and genkwanin at two positions. The proliferation rates of HTC-116 and HT-29 human colorectal cancer cells were measured with MTT colorimetric assay after treatment with the derived and parent compounds. It is expected that significant inhibition by apigenin and genkwanin on both cell lines will occur, based on previous studies, and also an enhanced effect from the brominated derivatives, based on a study of chrysin derivatives. Further research into the molecular targets of these compounds could lead to the development of high-affinity drugs, which could serve as potent and cancer-selective treatments.

Bio Sci Poster 8:

Genetic analysis of yeast in response to 4-methylcyclohexane methanol from Elk River chemical spill

Noor Malik and Jennifer Gallagher
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4-methylcyclohexane methanol (MCHM) spilled in the Elk River in 2014 contaminating drinking water for many West Virginians'. The cellular effects of MCHM are unknown. To identify possible targets, the expression of genes was measured in the model eukaryotic organism, *S. cerevisiae*, when exposed to MCHM. Many genes that changed in expression were regulated by Mediator, a multi-protein complex. This complex is found in all eukaryotes. Single mutants of different components of Mediator can make yeast more or less sensitive. Double mutants were generated to address how these mutations interacted. The double mutant *med15/med2* was more sensitive compared to single *med15* mutants. In parallel, yeast were evolved in lab to uncover pathways that may be important when responding to MCHM. After multiple generations, mutations that improved resistance in the cells will be passed on and identified using whole genome sequencing. Identifying these mutations will help us understand the long term effects of MCHM exposure as well as genomic regions responsible.

Biological Sciences Category

Bio Sci Poster 9:

Function of lipophorin receptors as they relate to the hedgehog pathway in horn development of beetles

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The focus of this ongoing research is to understand how unrelated developmental genes interact to influence non-vital traits. To do so, horn growth in dung beetles was observed because they are influenced by a sex-determination gene and a cell differentiation gene. The lab's previous research investigated the effects of knocking down one gene or the other, but where in these genes' signaling pathways connect is unknown. Cholesterol modifies the protein early in the aforementioned cell differentiation pathway, called hedgehog. The goal was to express the hedgehog gene but not allow its pathway to be modified. That required a means of keeping lipids from entering the cells. Subsequently, beetles use lipophorins to transport lipids, like cholesterol, across membranes, but require receptors to do so. By isolating the gene for these receptors, cultivating it, then injecting it into larvae as a double-stranded RNA, the cells should "attack" the RNA and similar strands. This should inhibit lipid transportation into the cells, limiting the amount cholesterol being utilized so the effects of the unmodified protein observed.

Bio Sci Poster 10:

Bioelectrical impedance analysis of smallmouth bass

Jonathan Fisk, Kyle Hartman and Ed Olesh
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One of the most popular sportfish in North America is the Smallmouth Bass (Micropterus dolomieu). Due to this popularity it is important have a healthy population for stakeholder's satisfaction. Previously measurements of a fish's condition were done by simple length weight measurements. However, these measurements do not tell the whole store as a fish can change its percent water weight by 30% in a day. However a technology known as Bioelectrical Impedance Analysis (BIA) is a non-lethal method that can be used to calculate the percent dry weight (%DW), a metric that could only be measured previously by sacrificing a fish, after an equation has been discovered. To do this we needed to collect wild Smallmouth Bass from several waterbodies in the Ohio drainage area and collect reactants and resistant measurements along with lengths and weights. These fish will them be sacrificed to obtain dry weights. With these measurements it is our objective to discover the equation for %DW, using the reactants and resistant measurements and thus no longer needing to sacrifice fish.

Biological Sciences Category

Bio Sci Poster 11:

Functionalization of silica nanoparticles with recombinant streptococcal collagen-like proteins for cancer research

Brittany T. Keller, Dudley McNitt and Slawomir Lukomski
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Extra cellular matrix surrounding tumors differ considerably from healthy tissue by the inclusion of cellular fibronectin isoforms containing extra domain A (EDA/cFn). These distinct tumor microenvironments that are rich with EDA/cFn are recognized by the streptococcal collagen-like protein 1, Scl1. We *hypothesize* that immobilizing recombinant Scl1 (rScl1) protein onto silica nanoparticles will aid these nanoparticles in targeting specific tumor sites. We designed *in silico* rScl1 constructs, cloned and expressed them in *Escherichia coli*, and then purified through affinity chromatography on a *Strep*tactin sepharose. SDS-PAGE analysis was used to confirm the purity and integrity of the rScl1 polypeptides, before assessing their collagen-like structure by circular dichroism spectroscopy. Purified rScl1 proteins were immobilized onto red-fluorescent streptavidin-coated silica nanoparticles via C-terminal *strep*-tag II, successful immobilization was confirmed by enzyme linked immunosorbent assay using anti-rScl1-specific antibody. rScl1- immobilized nanoparticles were tested for binding to EDA/cFn-coated surfaces. Our long-term objectives are to use these rScl1-functionalized silica nanoparticles for cancer diagnostic purposes, and as a vehicle for drug delivery to specific tumor sites for the eradication of cancer cells.

Bio Sci Poster 12:

Oncogenic MET kinase signaling impacts lung cancer immune checkpoint pathways

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Immune checkpoint inhibition has become standard treatment in advanced lung cancer. It reactivates a patient's own immune systems to combat cancer by blocking the tumor's immune escape via the PD-1/PD-L1 checkpoint interaction. MET kinase is a cancer target recognized in the Hallmarks of Cancer for its promotion of cancer invasion and metastases. We hypothesized that MET signaling/inhibition would dynamically impact the immune checkpoint pathways. We utilized NCI-H596 adenosquamous lung cancer cell line expressing the oncogenic MET exon-14 juxtamembrane splicing mutation as a model. Expression of immune signature genes including PD-L1 and IDO1 in NCI-H596 cells were studied under both MET ligand hepatocyte growth factor (HGF) induction and targeted inhibition. In a RT2 Profiler PCR Array Gene Expression analysis, H596 cells were found to have a reprogrammed gene expression signature during the 1-3 days under HGF stimulation including upregulated PD-L1 and downregulated IDO1, also validated by Western Blot analysis. Therapeutic cellular inhibition using crizotinib and CM-1 downregulated both PD-L1 and IDO1 expression. RNA-sequencing of HGF-stimulated H596 cells is underway for further comprehensive transcriptomics signature bioinformatics analysis.

Biological Sciences Category

Bio Sci Poster 13:

Crowders affect protein aggregation in Huntington's disease

Caleb Fan, Albert W. Pilkington, IV and Justin Legleiter
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Huntington's disease is an amyloid disease where an inherently disordered protein is misfolded and is correlated to symptoms. The misfolded Huntingtin protein, Htt, aggregates together to form a fibrillar structure which is observed in mouse models and across other amyloid diseases. How these aggregates form and interact in the cell is important to understanding toxicity development in Huntington's disease. Evidence suggests that aggregation is decreased in the presence of lipids possibly due to a crowding effect lowering favorable orientations of Htt for aggregation. To test the crowding effect, Htt is incubated with various unreactive crowding agents and lipids. The amount of fibrils at various time points are compared to observe its effects on rate of protein aggregation. Preliminary results suggest that crowders increase the rate at which Htt aggregates. There is a higher concentration of fibrils when incubated with crowders than in the control. The crowders possibly force Htt to interact more as they reduce the amount of empty space. This suggests that slower aggregation rates with lipids are due to unknown interactions between Htt and lipids, not the crowding effect.

Bio Sci Poster 14:

Increase in mutant Huntingtin protein aggregation leads to decrease in protein-lipid interaction

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Huntington's disease is an expanded polyglutamine neurodegenerative disease characterized by the aggregation of mutant Huntingtin protein into protein plaques known broadly as amyloids. The process by which these amyloids are formed goes through a variety of intermediates such as oligomers (multimeric species ranging in size) and fibrils (long protein aggregates developing from oligomers) ending with amyloids. These amyloids are a hallmark of the disease, but current knowledge of the subject has many questioning the toxic mechanism and role of the amyloids in said mechanism. We aimed to show how differing aggregation levels of Huntingtin affected the interaction between Huntingtin and lipid membranes. This was done by incubating Huntingtin Exon 1(model system) to differing stages of aggregation (monomer, oligomer, and fibril) and running these different samples in a polydiacetylene assay to quantify the interaction of each with cell membranes. Preliminary results show that Huntingtin had less interactions with cell membranes in samples containing higher fibril numbers indicating that it is likely monomeric or oligomeric intermediates responsible for the degradation of membranes in cells.

Engineering Category

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Engineering Category

Poster 16: Modeling and optimization of ion transport membrane for oxygen separation from air.
Allyson M. Brezler, Gaurav V. Mirlekar and Fernando V. Lima.

Poster 17: High-pressure analysis for fluid flow properties of shale core samples.
Steven H. Black, Mohamed Elsaig and Kashy Aminian.

Engineering Category

Engineering Poster 1:

A paper-based lateral flow strip for detection of traumatic brain injury protein biomarker

Devan J. Shell[1], Xuefei Gao[2] and Nianquiang (Nick) Wu[2]
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Protein biomarkers are becoming increasingly important in the diagnosis of various diseases such as traumatic brain injury (TBI). Conventional methods, such as enzyme-linked immunosorbent assay (ELISA), Western blot, and radio-immunoassay offer high accuracy and sensitivity for protein measurements. However, most of these methods require time consuming procedures and high cost, which is not suitable for efficient point-of-care use. In our study, we developed paper-based lateral flow test strips (LFTS) for protein biomarker detection in blood plasma samples. Both colorimetry and Surface-Enhanced Raman Spectroscopy (SERS) methods were integrated as signal transducers into PLFS. Detection sensitivity, anti-interference ability, and efficient point-of-care use were taken into careful consideration. The results indicate that colorimetric LFTS have advantages for protein biomarker such as timely analysis (within 20 min.), cost-effectiveness, and efficient point-of-care use. However, disadvantages include low detection sensitivity and signal interference from blood plasma sample matrices. Compared with colorimetric LFTSs, our SERS-based LFTS exhibits further advantages, including high sensitivity and anti-interference ability towards blood plasma samples for protein biomarker detection, which shows great promise for biomedical diagnosis of diseases.

Engineering Poster 2:

Towards virtualized transradial prosthesis with simulated dynamics and surface EMG interface

Amanda Barbarossa[1], Matthew Boots[2,3], Anton Sobinov[2,4], and Sergiy Yakovenko[1,2,3,4]
[1]Department of Chemical and Biomedical Engineering, [2]Center for Neuroscience, [3]Mechanical and Aerospace Engineering Department, [4]Exercise Physiology, West Virginia University, Morgantown, WV 26506

Highly advanced upper limb prosthetics often require an extensive trial and error process that can be frustrating for amputees. Diminished residual ability necessitates a personalized approach, accounting for the individual's capability to control prosthetics of different complexity. This problem may be solved by "test-driving" virtualized prosthesis. This study is driven by the rationale to develop the framework for testing the real-time control of a virtual hand model with 18 degrees of freedom (DoF) in a custom virtual reality (Multi-Joint dynamics with Contact, MuJoCo). The biological control signals were captured from the transradial forearm with a low-cost, user-friendly surface EMG system (Myoband). Able-bodied subjects were asked to follow behavioral tasks including hand flexion and extension. The arm and hand motions were captured by the custom motion capture system based on multiple six-DoF tracking devices (HTC Vive). In the developed real-time system, users control a realistic biomimetic model. We expect to solve the problem of kinematic tracking for verifying correct control of the model. Future work will use these systems to create virtual prosthetic testing for amputees.

Engineering Category

Engineering Poster 3:

Nature inspired advanced ceramic 3D structures with high strength density ratio

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Advanced ceramics have many desired properties for industries since they can withstand extremely hot temperatures, they are lightweight and they have high strength compared to other materials. The main problem with using ceramics in industry is that they are difficult to process and almost impossible to create complex structures. The microstructures that have been designed for mechanical testing are inspired by nature. The solution uses a 3D extruder to create the desired detailed shapes. The 3D extruder utilizes a syringe filled with a silicone paste, where upon ejection the paste is set with a UV light. After the complete part has been extruded the object will then be sintered in nitrogen gas. When silicone is introduced to nitrogen during sintering the object becomes a very strong ceramic. Once the object is extruded and sintered it is tested for mechanical strength. After testing the mechanical strength, the expected result is that the strength to density ratio of the natural microstructure will be higher than alternative materials.

Engineering Poster 4:

Evaluating sediment loss from reclaimed roadside locations

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Establishing vegetation cover following road construction is a common restoration practice to reduce sediment loss. This study evaluated the sediment yield from a roadside location in Grant County, West Virginia along US 48. Sediment yield was both measured in the field and predicted using the Modified Universal Soil Loss Equation (MUSLE). This study tested the ability of MUSLE to approximate sediment yield for a single storm. Four sediment traps were installed on four test plots (4.5 ft x 4.5 ft). Runoff samples were gathered from storms events, the samples were analyzed for total suspended solids, and sediment yield was calculated. Sediment yield was predicted using the geographic factors of the Moorefield area. Predicted erosion rates were over 18,000 times less than the measured values. These preliminary results suggest that MUSLE does not predict erosion rates adequately for small, roadside sites. Limitations included small plot size, limited rainfall, and plot distance. Data collections for additional storm events continue.

Engineering Category

Engineering Poster 5:

Blind search of isolated astrophysical pulses in phased array feed data

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In Radio Astronomy, the hardware has changed from using a single pixel receiver to using multiple sensors to widen the view angle of a telescope allowing for larger data collections in a single pointing. Due to this change in hardware, new signal detection algorithms, which optimally combine information "seeing" from each sensor, need to be developed. We have developed a mathematical description of an existing Phased Array Feed's (PAF) geometry and related it to an array manifold. We have also developed a model for noise correlation created by the array. Raw data acquired by the PAF was simulated using the array manifold and the noise correlation matrix. Three different optimal beamforming algorithms were implemented and used to search for an astrophysical pulse and to estimate the direction of its arrival. A blind search, for pulse detection, was performed by forming multiple beams with varying angles and calculating the value of the conventional Signal-to-Noise ratio (SNR). We present the developed algorithm for raw data simulation and report the SNR values for each optimal beamforming approach.

Engineering Poster 6:

Hand-held automatic diagnostic tool for the purposes of ear infection detection

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Ear infections [acute otitis media (AOM)] primarily affect young children between 6 and 24 months old: a demographic who are unable to adequately communicate their symptoms. Billions of dollars are spent between doctor's visits and treatments; however, not all ear infections require treatment from a doctor, often leading to overprescribed antibiotics. In order to more accurately and efficiently determine the presence of an ear infection, a hand-held automatic diagnostic tool is being developed. This research focuses on building a diagnostic tool that can be operated by an unskilled user to make a diagnosis. The initial prototype will be able to translate the qualitative parameters such as the color, position, and translucency of the tympanic membrane into a quantitative value that will be used to make the diagnosis. This technology has the capacity provide a significant benefit to the health of children in the United States as well as in developing countries.

Engineering Category

Engineering Poster 7:

Modeling and simulation of pollution control units for improved sustainability

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The United States Environmental Protection Agency, U.S. EPA, has long pushed for regulations on chemical processes to reduce the impact the processes have on the environment. In order to cope with the growing problem of pollution by the release of various chemicals into the environment, it is necessary to develop pieces of equipment to purify and clean waste streams from chemical plants. As part of this project, four pollution control units have been modeled in Microsoft Excel using Microsoft VBA. In order to test the units, a chemical process model for the simulation of the manufacture of acetic acid from methanol was developed in CHEMCAD. The output from the gaseous waste streams of the acetic acid production process are connected to the units, where the waste products are treated to minimize the environmental releases. Preliminary results show that the pollution control units are capable of treating two process output streams, thus increasing process feasibility and sustainability.

Engineering Poster 8:

Exploring undergraduate transportation engineering student attitudes towards a novel research topic identification technique

J.D. Gatlin[1], V.D. Pyrialakou[1], H.A. Diefes-Dux[2], K. Gkritza[3] and D. Martinelli[1]
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The expansion of active and project-based learning highlights new issues in and opportunities for engineering education. Some introductory transportation engineering instructors have begun to incorporate collaborative, semester-long research and synthesis projects to address the increasingly complex and interdisciplinary nature of their industry. Open topic selection, while praised for its ability to increase student ownership, appears to introduce problems of its own. At Purdue and West Virginia University, 141 students were surveyed about their use of a moderated research needs database in their topic identification process. Accounting for demographics and other control variables, and combining the survey responses with other datasets generated from student citations, products, and performance, this research will use quantitative analyses to test hypothesized singular and composite indicators associated with attitudes in use of the database: high-performing students and groups, exposure, ease of use, content availability, and student strategies. Additionally, a set of descriptive statistics and a qualitative thematic analysis of the open-ended questions will begin to build a feedback mechanism for future use and improvement of the database in undergraduate academia.

Engineering Category

Engineering Poster 9:

Deep learning for supervised domain adaptation and generalization

Timothy Scott, Saeid Motiian and Gianfranco Doretto
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Deep learning has shown great success in many fields, especially computer vision. One of the main limitations of deep learning is availability of large datasets. One solution to this problem is supervised domain adaptation, in which a deep learning model is trained on one large labeled dataset, and then adapted to work on a different task, using a very small, labeled dataset. In this work, we investigate the effectiveness of several different domain adaptation techniques, including alignment, separation, contrastive loss, and triplet loss. We used the MNIST and USPS datasets, which are two slightly different sets of images of handwritten digits. We show that contrastive loss and triplet loss perform significantly better than a baseline experiment with no explicit domain adaptation. Specifically, on MNIST to USPS adaptation with one sample per class, contrastive loss achieves 88.6% accuracy vs. 77.6% for the baseline. On USPS to MNIST adaptation, contrastive loss achieves 91.7% accuracy vs. 54.9% for the baseline. The triplet loss achieved accuracy not significantly different from the contrastive loss.

Engineering Poster 10:

Robust empirical modeling of stream Chlorophyll-a across time and space: scaling by a single reference observation

Brittany I. Brush, Omar I. Abdul-Aziz and Mohammad A. Z. Siddik
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Chlorophyll-a (Chl-a) is a green pigment in plants, and is a powerful indicator of stream water quality and ecosystem health. Chl-a concentrations typically represent a diurnal cycle, which can vary across sites, seasons and years. However, continuous observations of Chl-a are rarely available. A[u1] [OAA2] robust empirical model was developed to solve this problem by using continuous (hourly) observations recorded in 26 streams across the continental United States. A single reference observation from each diurnal cycle was considered as a scaling parameter to normalize different cycles into a general dimensionless cycle. The scaled cycle was then estimated by employing an extended stochastic harmonic algorithm. Model calibrations and validations indicated good predictions. Estimated model parameters did not noticeably vary in time and space, leading to a single parameter set. The model can predict the entire diurnal cycle of hourly Chl-a from the corresponding single reference observation for a chosen stream. The model can, therefore, be used as an ecological engineering tool to robustly estimate missing data, and make a dynamic assessment of stream health.

Engineering Category

Engineering Poster 11:

Effect of obstacles on premixed flame oscillation in narrow, fully open channels

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Studying combustion in channels/tubes is important in today's fuel-reliant society. The more we know about these catastrophic events, the more likely it is that detonation could be prevented or mitigated. This research aimed to understand how varying different parameters affected oscillation patterns of flame velocity in narrow channels with evenly spaced obstacles along the walls, similar to a comb. The parameters varied included: obstacle size, obstacle spacing, thermal expansion coefficient (different expansion coefficient signifies different fuel mixtures, and thus burning temperature), and resolution. The work was conducted using a program that calculated flame specifications when different variables were altered. Then, the data was analyzed using graphing tools and video simulations. It was found that period of oscillation increased with larger obstacle size, larger spaces between the obstacles, and smaller expansion coefficient. Amplitude increased with smaller thermal expansion coefficient and larger spaces between obstacles, and average burning rate increased with smaller expansion coefficient and smaller spaces between obstacles.

Engineering Poster 12:

Musculoskeletal modeling of the lower-limb: a novel approach for locomotor rehabilitation

Abby Williamson[1], Matthew Boots[2], Anton Sobinov[2] and Sergiy Yakovenko[2],
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Locomotor rehabilitation is an effective method for improving basic activities of daily living after stroke, spinal cord injury, or amputation. However, multiple subject-specific factors can hinder improvements during rehabilitation. These problems could be addressed with assistive technologies (i.e. prostheses or the functional electrical stimulation operated by biomimetic controllers). This project aimed to develop the basis for all biomimetic controllers: a biomechanical real- time model of the human lower- limb. I developed a musculoskeletal model with 46 main leg muscles spanning the hip, knee, and ankle joints. The constraints on muscle path geometry were adjusted interactively until the simulated multi-dimensional relationship matched the experimental dataset collected from over 15 published sources. We validated muscle models using both subjective and analytical measures. Model function was than evaluated in a real-time experiment to control virtualized leg movement using 16 EMG signals streamed from main leg muscles. The model simulated a cycling motion similar to the desired movement. The lower-limb model is a novel tool for real-time prosthetic control. Moreover, this model can be used to evaluate residual functions in lower-limb amputees and in development of innovative quantitative methods for their locomotor rehabilitation.

Engineering Category

Engineering Poster 13:

Learning basic concepts of self-driving cars using an NXP cup car

Gregory Hughes and Powsiri Klinkhachorn
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The feasibility of self-driving cars is a heavily researched topic in the field of Computer Science. This led the NXP Semiconductors company to start the NXP Cup, a competition where teams of students make and program little model cars to autonomously navigate a series of tracks as fast as possible, to help supplement their own research on the subject. To aid in the understanding of the basic concepts of self-driving cars, a partially assembled NXP cup car was acquired and tinkered with. The car came with a line-scan camera and a Freescale-brand microcontroller. Using the C language and the mbed online compiler, programs were written and transferred to the microcontroller to interface with the motor, the steering, and the camera all separately. I expect to be able to get those three components to work together for an extremely simplified demonstration of how self-driving cars function. While not groundbreaking, this project has broadened my understanding of microcontrollers and image processing.

Engineering Poster 14:

Robotics research test platform

Conner Castle, Dylan Reynolds and Yu Gu
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Robotics research tends to involve many separate devices on which a certain experiment or research can be tested. These devices take up physical space and may not be adaptable as time progresses and research changes. This project proposes a single testing platform with the robustness and customizability to perform a multitude of differing types of robotics research; which can be updated and changed to the needs of the researcher as the research progresses. The proposed platform consists of a test bed, cameras, projector, computer, accompanying "base" robots, all built for a custom-made T-slot aluminum structure. The software operating the platform is the robotics operating system (ROS); which allows for a variety of different programs to be compatible, and the T-slot aluminum allows for customization as time progresses. The structure has been erected and one camera has been integrated with the ROS software. Once the system is entirely put together, a researcher will be afforded the ability to perform many types of research operating from a single convenient platform instead of many separate devices.

Engineering Category

Engineering Poster 15:

Autonomous pollination robot for use on blackberry and raspberry plants

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Due to the decline of native pollinators in recent years, the cost of farmers to rent these pollinators for their crops has increased. In order to alleviate the cost burden for farmers and offer a reliable alternative for pollination to increase productivity, a team at WVU has been tasked with designing a robot that will autonomously pollinate blackberry and raspberry plants in a controlled greenhouse environment. Machine learning is being used to "teach" the robot what a flower is, flowers' poses, and whether they are ready to pollinate. Inception v3's (Google's machine learning open source code) final layer is being retrained using TensorFlow to achieve this. The results currently achieve approximately 80% accuracy, but the goal is for over 95%. Other key programs are in the process of being finished so the accuracy can reach its desired level. After every part of the robot is complete, it will be tested on brambles to determine its efficiency compared to native pollinators.

Engineering Poster 16:

Modeling and optimization of ion transport membrane for oxygen separation from air

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The use of high purity oxygen instead of air in fossil fuel combustion processes can increase conversion and aid in the decrease of CO_2 and NO_x emissions. Cryogenic air separation is the current technology implemented to produce oxygen, but operation requires large energy inputs that result in high costs. Ion transport membranes (ITM) for oxygen separation is a new technology that can be used in place of the cryogenic process to decrease costs. An ITM model was designed by applying a permeation flux equation to a plug flow reactor design equation. Preliminary results show that after optimizations the cost of a membrane required to produce oxygen for an integrated gasification combined cycle (IGCC) power plant decreased from the base case design cost. Further optimizations will be discussed to improve cost reductions. By generating a model for the membrane that is overall less expensive than current air separation units will help push this technology further towards implementation into chemical processes.

Engineering Category

Engineering Poster 17:

High-pressure analysis for fluid flow properties of shale core samples

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The petroleum and natural gas industry has been expanding in the recent years. There is an increasing desire to help the industry become more accurate, and efficient with its measurements, in order to expedite discovery and extraction of petroleum and natural gas. Testing samples at reservoir conditions will help complete this as well as greatly increase the understanding and accuracy of potential production amounts and rates. The process placed shale rock core samples in a controlled system so that analysis of fluid flow and potential productivity at reservoir conditions could be estimated. The system involves two tanks at set pressures that transfer gas from one to the other, then based on the gas flow rate it is possible to calculate permeability or porosity. The findings show an exponential relationship between the reservoir confining pressure and permeability, or porosity, as well as an even stronger relationship between pore pressure and these properties. The raw data collected can then be used with equations and corrections to give more information about the reservoir in absolute terms.

Health Sciences Category

Health Sciences Index:

Health Sciences Category

Poster 15: TGF-β influences proliferation of MDA-MB-231-BR3 triple negative breast cancer cells. **Janelle Chuah**, Samuel A. Sprowls and Paul R. Lockman.

Poster 16: Revisiting cortactin as a driver of collective invasion in 11q13 amplified HNSCC. **River A. Hames**, Brenen W. Papenberg, Jessica L. Allen, Steven M. Markwell, Elyse L. Walk, Amanda G. Ammer and Scott A. Weed.

Health Sciences Category

Health Sci Poster 1:

Development of a high output experimental model to study drug resistance in cancer

Steven Wu, Chayanin Kiratipaiboon and Yon Rojanasakul
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Chemoresistance is one of the major obstacles to successful cancer therapy. ABCG2, a transport protein, has been reported to play a critical role in chemoresistance. Emerging evidence indicates an overexpression of ABCG2 in cisplatin treated non-small cell lung cancer (NSCLC) leading to cisplatin resistance. However, there is a lack of information on the causal relationship between ABCG2 expression and cisplatin resistance as well as the underlying mechanisms in NSCLC. This study aims to develop a rapid and quantitative experimental model to investigate the casual relationship between cisplatin-induced ABCG2 expression and chemoresistance in NSCLC. Using ABCG2-luciferase (LUC) reporter H460 cells as a model system, cisplatin resistance was induced and IC50 values of cisplatin and luciferase activity of cisplatin-resistant cells were determined by cell viability using Graphpad Prism and by luciferase assay, respectively. The results demonstrated a linear correlation between luciferase activity and IC50 in cisplatin-resistant lung cancer H460 cells (r2 = 0.83). This finding may facilitate the development of a high throughput screen for anticancer therapeutics and for new drug discovery and mechanistic investigations.

Health Sci Poster 2:

A role for tumor macrophage-derived microvesicles in regulation of epithelial-to-mesenchymal transition

Kaltume Usman Ndayako, Amy Gross, Joyce Obeng, Clay Marsh, Timothy D. Eubank and Duaa Dakhlallah
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Macrophages are classified into two populations: M1, pro-inflammatory and anti-tumor to support cytotoxic T cell function, and M2 which suppress immune cell killing and support angiogenesis and progression. Genes involved in Epithelial-to-Mesenchymal transition (EMT) regulate tumor cell plasticity and dictate metastasis while GRHL transcription factors suppress EMT. We investigated a role for macrophage-secreted microvesicles (MVs) to modulate EMT. Our data suggests that MVs derived from M1 and M2 macrophages are taken-up and disparately induce GRHL1/2 mRNAs expression in mammary epithelial and breast cancer cells. Surprisingly, we found that M2 MVs are protective against EMT in mammary epithelial cells by augmenting GRHL1/2 expression and suppressing cell migration, but not protective in breast tumor cells where it was M1 MVs which played the suppressive role. These data suggest that M2 macrophages may play a protective role against initiation of EMT while M1 macrophages may induce reversal of EMT in established breast tumors.

Health Sciences Category

Health Sci Poster 3:

Refining a model for a novel drug treatment of glioblastoma multiforme

Osasenaga Benjy-osarenkhoe[1], Neal Shah[2], Paul R Lockman[2], Bjorn CG Soderberg[3], John B Barnett[1]
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Glioblastoma multiforme (GBM) are stage IV brain tumors with a five-year survival rate of less than 5%. Currently treatments for GBM are not curative and all have potentially devastating side effects. Our lab has been exploring the anti-tumor characteristics of N-methyl-3-(3,4-dichloroanilino)-3-oxopropanoic acid (N-MeDCOPA). N-MeDCOPA inhibits Orai calcium channels, which GBM depend on to increase gene expression. Due to promising inhibition *in vitro*, an *in vivo* model must now be developed. U251MG glioblastoma cells were transfected to induce luminescence prior to intracranial implantation into a nude mouse model. Imaging indicated that the tumors were growing, although all mice survived 30 days with no treatment. This demonstrated a need for fine-tuning of the methods before moving forward. Because this compound had not been tested in an animal model of GBM, we explored the pharmacokinetic profile and have developed the administration protocol best suited for this project. It was determined that polyethyleneglycol 400 or beta-Cyclodextrin would be used as a vehicle in future experiments. This refined protocol will be implemented in future experiments to determine the treatment potential.

Health Sci Poster 4:

Assessment of inflammation induced by multi-walled carbon nanotubes and carbon nanofibers from U.S. facilities

Sarah Foster[1,2], Kelly E. Smith-Fraser[1,2], Vamsi K. Kodali[2], Tracy Eye[2] and Aaron Erdely[1,2]
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Carbon nanotubes and nanofibers CNT/F are engineered nanoparticles used in electronic, medical, and composite industries. The primary risk of exposure to these nanomaterials occurs during dry powder handling after production. Preliminary research reported CNT/F induce pulmonary inflammation. However, CNT/F represent a broad class of materials and minimal research has been conducted on the majority of these materials. Our goal was to test the pulmonary inflammatory response induced by 9 different CNT/F in mice at 1, 7, 28, and 84 days following exposure by oropharyngeal aspiration to 4 or 40μg of CNT/F. Materials with larger diameters induced a greater inflammatory cell infiltration, primarily polymorphonuclear cells by 37%, and gene and protein expression (e.g., IL-1β, CCL22/MDC, IL-6) compared to materials with smaller diameters. Also, inflammation was sustained longer in larger diameter materials with resolution by 84d. Our findings support that CNT/F may be stratified by physicochemical characteristics.

Disclaimer: The findings and conclusions in this report are those of the authors and do not represent the views of the National Institute for Occupational Safety and Health.

Health Sciences Category

Health Sci Poster 5:

Community assessment and education to promote behavioral health planning and evaluation (CAPE)

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Mental health and substance use disorders affect approximately 20% of the U.S. population and are often comorbid. Clinicians and behavioral healthcare workers report lack of resources available to guide their programs and too great of a gap between research findings and program implementation. CAPE was created to address this discrepancy between evidence obtained from research and program dissemination and implementation. Phase I compiled behavioral health data from ten communities into easy to read snapshots and reports. Phase II created affordable, replicable, and adaptable community-level behavioral health interventions. Index and Innovation interventions included Mental Health First Aid Training, Mindfulness Training, and creation of an addiction awareness website, AddictionHappens.org. The results of this initiative were implementation of evidence-based practices and compilation of results for other communities to easily replicate. Next steps focus on addressing mental health and substance use disorder stigma and implementing a holistic, psychosocial approach to treatment, as patients have reported a three-fold preference for this over medication-based treatments. Overall implication is improvement in treatment outcomes by empowering individuals to drive and sustain their recovery.

Health Sci Poster 6:

Use of metal organic frameworks for drug delivery systems

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Metal Organic Frameworks (MOFs) are hybrid materials consisting of metal ions and organic bridging molecules that form networks of empty pores. Studies showed that their internal surface area is large enough to be used for the slow-release of encapsulated medications delivered to the human body. This research focuses on evaluating the potential of user-synthesized, aluminum-edged MOFs to deliver the cardiac glycoside drug digitoxin to human epithelial cancer cells. Digitoxin was used as a drug model since growing evidence indicates that it is a promising anticancer agent at therapeutic concentrations. Experiments performed using cellular and microscopy assays evaluated cell ability to uptake MOFs and determined the dose that leads to maximum cell viability. Furthermore, spectroscopical assays evaluated the ability of MOFs to encapsulate digitoxin, while cellular assays characterized the cell fate upon delivery of MOF-digitoxin complexes. Preliminary results showed that cell ability to uptake MOFs or complexes is drug-dose dependent and hint at the potential of MOFs to serve as the next generation of potent drug delivery vehicles that ensure high drug loadings under versatile functionality.

Health Sciences Category

Health Sci Poster 7:

Patient and nurse perspectives on safety screening in emergency department and urgent care settings

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The inclusion of questions assessing patient safety has become common practice during healthcare visits. However, current research has not shown that safety screening (e.g., about intimate partner violence) is effective in obtaining positive disclosures. There is a need to determine patient and provider perspectives on asking and being asked safety-screening questions. The purpose of this study was to examine the practices and opinions of both nurses and patients in an emergency department and urgent care/student health settings using an anonymous, self-administered questionnaire. Data will be analyzed to determine the types of questions most commonly asked and opinions on comfortability and appropriateness of asking these questions in clinical settings. The results will yield meaningful information about what, if any, changes are necessary to better suit the needs of patients and providers in these settings. This study is significant because to our knowledge, a similar study does not exist and it could be used to improve safety-screening practices.

Health Sci Poster 8:

Quantifying percent breakdown from JWH-018 and heroin to thermal degradation products using peak intensities

Victoria R. Zeger[1,2], Stephen Raso[1] and Suzanne Bell[2]
[1]C. Eugene Bennett Department of Chemistry and [2]Department of Forensics and Investigative Science, West Virginia University, Morgantown, WV 26506-6045

Novel psychoactive substances (NPSs), such as synthetic cannabinoids, and opiates are frequently ingested by smoking. In literature reports from the 1970s, smoking heroin correlated to increased instances of brain encephalopathies and current abuse of NPSs represents a similar threat to public health. The goal of this project was to exhaustively characterize thermal degradation products of synthetic cannabinoids on plant matter and to revisit by-products of heroin to update the literature. A key objective was to establish percent breakdown of parent compounds to by-products through typical preparation and smoking scenarios and to determine percent recovery of the method used. Samples were collected using a previously designed method and data was analyzed via GC/MS. Mass recovery and percent breakdown of an NPS were observed at approximately 63% and 42% respectively, corresponding to the amount of drug and by-products ingested. Noteworthy results are expected with the analysis of heroin as well. To our knowledge, this is the first study to estimate percent breakdown associated with smoked drugs of abuse, which has numerous clinical and public health implications.

Health Sciences Category

Health Sci Poster 9:

Inhibition of mitochondrial respiration in Acute Lymphoblastic Leukemia within the bone marrow microenvironment

Patrick M. Thomas, Rajesh R. Nair, Debra Piktel, Werner Geldenhuys, John Hollander and Laura F. Gibson
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The current anti-leukemic drugs are unable to induce cell death in the leukemic cells residing with the bone marrow microenvironment, resulting in disease relapse in patients. To counter this hurdle, we have developed a co-culture model that mimics the bone marrow microenvironment and characterized the leukemic cell population that are resistant to drug therapy. Our experimental observations show that these resistant cells have deregulated mitochondrial respiration, which is accompanied by increased activation of hexokinase II and protein kinase B (Akt) and a reciprocal inhibition of AMPK. Interestingly, exposing the co-culture to an anthelmintic drug, Pyrivinium Pamoate, a known inhibitor of mitochondrial respiration leads to cell death in the resistant leukemic population. This Pyrivimium Pamoate-mediated cell death was accompanied by a significant decrease in the ATP production in these cells. Taken together, this study highlights the value of targeting the mitochondria to eradicate drug resistant leukemic population from the bone marrow and thus preventing disease relapse.

Health Sci Poster 10:

Metabolite analyses of rat plasma samples upon exposure to TiO_2 nanoparticles

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Titanium dioxide (TiO_2) nanoparticles are commonly used in a wide range of products, including cosmetics, foods, dyes, and paints. However, research has found that pulmonary exposure to TiO_2 nanoparticles may have adverse effects on microvasculature function. Using ion mobility, mass spectrometry and gas-phase hydrogen-deuterium exchange, we are examining whether pulmonary exposure to TiO_2 nanoparticles affects circulating metabolites found in plasma. Methanol and chloroform were used to extract polar and nonpolar metabolites from rats exposed to TiO_2 nanoparticles by inhalation as well as control organisms. Metabolite extracts were then analyzed on a home-built ion mobility instrument coupled to a mass spectrometer. Metabolite ions were exposed to deuterium oxide in the gas phase and allowed to exchange hydrogen atoms for deuterium atoms. The overall goal was to increase the number of analytical measurements that could be used to distinguish isobaric and isomeric metabolites. A combination of in-house and commercial software used to extract the raw data, align the dataset peaks, normalize the data, and perform principal component analysis (PCA). Metabolites exhibiting the greatest difference between sample cohorts are being submitted to biopathway analysis.

Health Sciences Category

Health Sci Poster 11:

The influence of sex chromosome-specific gut microbiomes on a sexually dimorphic immune response

Andrea Pettit[1], Rosana Schafer[1], Evelyn Onga[2], Kathryn Blethen[1] and Jennifer Franko[1]
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While immune-related sexual dimorphisms have previously been attributed to differences in sex hormones, XX vs. XY sex chromosome complements and distinct gut microbiomes may play a role. In an effort to identify underlying mechanisms contributing to distinct male vs. female immune responses, the gut microbiome composition of four-core genotype (4CG) mice and its influence on a sexually dimorphic immune response was evaluated. 16s rDNA sequencing and metagenomics analysis was performed on DNA isolated from the fecal pellets of 6-8 week old 4CG mice and again 4 weeks post-gonadectomy. Distinct populations of bacteria were identified between XX females and XY males, and also between XX and XY males, suggesting a role for sex chromosome complements in the regulation of gut microbiome composition. Elimination of gut bacteria by antibiotic administration demonstrated a potential role for sex chromosome-specific gut microbiomes on the XX-dependent propanil-mediated enhancement of heat-killed *Streptococcus pneunomiae* immune responses. By determining mechanisms underlying sexually dimorphic immune responses, gender tailored treatments can be developed to counteract both female-biased autoimmune diseases and decreased immunization responses in males.

Health Sci Poster 12:

Screening method for dietary supplements using direct analysis in real time mass spectrometry

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Some dietary supplements have been found to contain stimulants that are prohibited by the U.S. Food and Drug Administration, World Anti-Doping Agency, and Brazil's National Health Surveillance Agency for causing adverse side effects, such as cardiac arrest. For crime labs to prove that seized supplements contain these compounds, simple, sensible, and reliable methods are necessary to perform their analysis. Direct analysis in real time mass spectrometry (DART-MS/MS) is being used to develop a faster alternative to current screening methods since it takes only a few seconds to analyze each sample. 109 supplements provided by the Federal Police in Brazil will be analyzed to detect whether 1,3-dimethylamylamine, caffeine, synephrine, ephedrine, sibutramine, and methylphenidate are present. The optimization of DART-MS/MS parameters along with preliminary results obtained by testing standard solutions of these compounds indicate that they can be detected using the developed method. The results of this study will be compared with those obtained by a confirmatory technique using liquid chromatography mass spectrometry (LC-MS/MS).

Health Sciences Category

Health Sci Poster 13:

Toxicity studies of metallic organic frameworks (MOFs) in human lung epithelial cells

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Metallic organic frameworks (MOFs) are crystalline-hybrid porous materials with ultrahigh surface areas used in a variety of manufacturing processes, from separation membranes to catalysis and drug delivery. However, the safety of these nanomaterials for humans and the environment is a matter of serious concern. In this study, novel, rectangular box-shaped MOFs were investigated for cytotoxicity in model human lung epithelial cells. For this, cells were exposed to a range of doses of MOFs to determine the IC50, which is the concentration of MOFs where the number of viable cells is reduced by half. Cellular viability was also qualitatively measured after 24, 48, and 72 hours, as well as stress exhibited via reactive oxygen species released by cells following MOF treatment. Morphological evaluation was performed using optical microscopy and real-time via electric cell impedance sensing (ECIS) following exposure. Our analyses have shown that cellular exposure causes cellular fate changes in a dose-dependent manner, supporting the hypothesis that more comprehensive studies on possible health risks of these emerging materials must be performed before use in practical applications.

Health Sci Poster 14:

Development of a cell-based screening platform for drug discovery of neuroinflammation treatment

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Transcription factor STAT5 is a potential therapeutic target as its persistent activation has been linked to inflammatory diseases. However, complete blockage of STAT5 activity may result in serious side effects due to its broad physiological roles. Therefore, novel strategies that selectively reduce STAT5 activity are in need. Activated STAT5 forms dimers and tetramers, and we discovered that STAT5 tetramers are critical for the progression of neuroinflammation. Thus, small molecules that reduce tetramer activity may become novel therapeutics for treating neuroinflammation with high selectivity. The overall goal of this project is to develop a cell-based, high throughput platform for screening small molecules that target STAT5 tetramers but not dimers. This goal can be achieved by establishing a cell-based, luciferase reporter assay. To date, we have identified cell lines that can be used for establishing the reporter assay. We are in the process of cloning the luciferase reporter constructs, and herein present the experimental strategies and current progress.

Health Sciences Category

Health Sci Poster 15:

TGF-ß influences proliferation of MDA-MB-231-BR3 triple negative breast cancer cells

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A common phenotype of cancer cells is their unregulated cell growth. Transforming growth factor-β (TGF-β) is a protein that triggers signal pathways crucial for multiple processes such as proliferation, apoptosis, and migration. TGF-ß is implicated in multiple pathways within metastasis of cancer. To demonstrate the effects of TGF-ß on our brain seeding variant of breast cancer cells, a scratch assay was performed using our MDA-MB-231-BR3 (TNBC) cell line. We observed cell proliferation over a period of 24 hours in six different conditions. Conditions included control (media alone), 5ng/mL TGF-ß, 10ng/mL TGF-ß, 1µM SB431542 (TGF-ß Receptor inhibitor), 5ng/mL TGF-ß + 1µM SB431542, and 10ng/mL TGF-ß + 1µM SB431542. Results indicated an increase in percent wound closure when compared to control for both concentrations of TGF-ß. However, the combination approach yielded an increase in percent wound closure as well. A higher concentration of inhibitor may need to be used in future attempts. In conclusion TGF-ß drives proliferation of a brain seeking breast cancer cell line.

Health Sci Poster 16:

Revisiting cortactin as a driver of collective invasion in 11q13 amplified HNSCC

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Head and neck squamous cell carcinoma (HNSCC) is an invasive cancer with a five-year survival of 50%. Incidence is increasing Appalachia due to tobacco and HPV exposure. Genomic instability due to carcinogens results in amplification of chromosome 11q13 in 25% of cases. This results in poorer prognosis. The CTTN locus resides in 11q13 and encodes the protein cortactin. Increased cortactin drives invasiveness through cell migration and invadopodia. Invadopodia are membrane protrusions responsible for degrading stromal proteins. Prior studies demonstrated that reduced cortactin expression impairs invadopodia. However, 3D *in vitro* and knockout mouse models indicates that cortactin removal fails to block invasion. The purpose of this study is to determine the role of cortactin in invadopodia function and invasion. The hypothesis is that HNSCC has compensatory cortactin and/or invadopodia-independent mechanisms capable of driving invasion. We produced cortactin knock-out cell lines with CRISPR-Cas9. These lines will be evaluated for invadopodia function and invasion. Defining the role of cortactin is critical to understanding the consequences of amplification, allowing for intervention and target design in this patient subset.

Nanoscience Category

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Nanoscience Category

Nanoscience Poster 1:

Improving titanium dioxide nanoparticle suspension for aquatic toxicity studies of endocrine disruptors

Courtney J. Kristoff, Marriah C. G. Ellington and Lisa A. Holland
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Approximately 38,000 tons of titanium dioxide nanoparticles ($nTiO_2$) are disposed of in the water systems each year, but the health effects of them are unknown. These nanoparticles have demonstrated endocrine-disruption in laboratory studies; however, different methods of dosing were used because $nTiO_2$ is difficult to suspend and deliver in aquatic systems. A standard protocol is necessary in order to ensure consistency across aquatic toxicity studies. The Organization for Economic Cooperation and Development provides guidelines for aquatic toxicity studies that state the concentration of test substance throughout the 21-day study must remain within ±20% of the initial concentration. However, no effective procedure has been developed for maintaining that concentration when using insoluble materials. The focus of this research is developing the most effective method for suspending $nTiO_2$ in solution. Titanium dioxide nanoparticles were suspended in solution and samples were collected over a 12-hour period to be analyzed via inductively coupled plasma optical emission spectroscopy. Once developed, the method is applied to a 21-day aquatic toxicity study to analyze the endocrine-disrupting health effects of $nTiO_2$ in zebrafish.

Nanoscience Poster 2:

Charging dynamics of single InGaAs quantum dots under resonant excitation

Samantha D. Isaac[1], Gary R. Lander[1], Disheng Chen[1], Samet Demircan[1], Raju KC[1], Glenn S. Solomon[2] and Edward B. Flagg[1]
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Due to their potential to generate single indistinguishable photons, quantum dots are prime candidates for the development of quantum bits, or qubits, for quantum computation protocols. In theory, photon emission requires only the excitation of the quantum dot from a laser that is resonant with the system. In practice, due to charge relaxation processes with the semiconductor host, a second higher-energy laser is required to also excite the system in order to produce a photon. If quantum dots are ever to be used as qubits, these charge relaxation processes must be fully characterized. By modulating this higher-energy laser while keeping the resonant laser on, we have measured the time dependence of the fluorescence emitted by the quantum dot. We are developing physical models that will be used to fit this data. These models focus on the charge populations within the quantum dot as well as in external reservoirs. We expect our results to confirm there exists some external reservoir, possibly a defect, heavily influencing the charge dynamics of the quantum dot.

Nanoscience Category

Nanoscience Poster 3:

Toxicity of inhaled welding fumes on exposed worker respiratory and reproductive cell lines

Karagan A. Mulhall[1], Anna M. Morris[1], Nicole S. Olgun[1] and Stephen S. Leonard[1,2]

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The U.S. Department of Labor Women's Bureau says that the number of female welders in the United States is approximately 26,000 and has increased by more than 2% over the past decade. This work causes welders to inhale fumes produced by the metal rods. Our study uses mouse monocyte macrophages (RAW 264.7) and human placental cells (HTR8) to investigate the possible toxicity of stainless steel (SS) and mild steel (MS) welding fumes on respiratory and reproductive systems. Welding fumes were collected and sized to determine their chemical characteristics and ability to penetrate biological systems. The possible toxic effects of both types of fume were measured using cell viability, generation of reactive oxygen species (ROS), cell membrane damage, DNA damage, and cytokine release. Fumes were found to contain different chemical make-up and a mean size of 166.2 nm. ROS showed an increase after exposure with SS fumes being significantly higher. Both DNA damage and cytokine production showed increases after exposure. SS showed increase in toxicity when compared to MS in both RAW 264.7 and HTR8.

Nanoscience Poster 4:

Optimizing the treatment of substrates for high quality growth for magnetic materials

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Many current and future devices rely on the use of magnetic materials, such as non-volatile computer memory, energy generation, and sensing. However, sometimes magnetic materials lose their magnetic properties, especially when thickness is decreased, which greatly impacts the performance of the device. At this time, the quality of the substrate can influence the magnetic properties it possesses, but the cause of this lost magnetism is unknown. The goal of this project is to finalize a recipe of ideal cleaning and annealing for the production of consistent, high quality substrates. This was done by adjusting different aspects of the substrate treatment such as: elements used for cleaning, annealing time, annealing temperature, the type of furnace used in annealing, and the substrate placement within the furnace. The surface quality of the single-terminated, flat substrate is determined through atomic force microscopy. After magnetic measurements, the quality of the substrate was found not have a major effect on the loss of magnetism, it is instead due to some aspect of the thin film which is now being explored.

Nanoscience Category

Nanoscience Poster 5:

Immobilization platform for the next generation of efficient enzyme-based systems with industrial applications

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Carbonic anhydrase (CA) accelerates the conversion of CO2 into carbonates by one million molecules per second. Under industrial conditions in CO2 capture and sequestration, this rate is substantially reduced. We use a combinatorial approach employing both computational and experimental designs to evaluate strategies maximizing enzyme functionality for industrial sustainability. The enzymes soybean peroxidase (SBP), a model enzyme and carbonic anhydrase (CA), the enzyme of interest, were rendered in 3D using SwissPDB software, determining active sites allowing predictions to be made relevant to binding to nanosupports. Bicinchoninic acid (BCA) assay was performed to determine bound enzyme concentration, and enzyme specific activity assays were performed to both free and bound enzymes to measure changes in kinetic activity. Experimental analysis showed that changes in enzyme kinetics are function of the nanosupport and method used for immobilization. Computational analysis showed that these changes are due to enzyme-nanosupport interactions can be predicted based on enzyme surface properties. Our results suggest that industrial applications of CA could become feasible if ensure user-controlled immobilization techniques utilizing computational predictions are implemented.

Nanoscience Poster 6:

Determining the relationship between the functionalization of carbon nanotubes and their toxicity

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Carbon nanotubes have a high presence in the manufacturing industry and their toxicity is still not well known. Carbon nanotubes can easily aerosolize and studies have shown when inhaled they have potential to cause pulmonary complications. It has been suggested that there is a reduction in toxicity when the carbon nanotubes are functionalized rather than when they are in their pristine form. The simplest functionalization method is carboxylation via acid washing. The acid washing process consists of sonicating Mitsui 7 carbon nanotubes in a concentrated sulfuric acid and nitric acid mixture for a desired amount of time. In this study, three degrees of carboxylation on Mitsui 7 carbon nanotubes were obtained and characterized via capillary electrophoresis. Once characterized an exposure study on immortalized respiratory epithelial cells was performed using a low and a high dose of the three different degrees of carboxylated Mitsui 7 carbon nanotubes and pristine Mitsui 7 carbon nanotubes. Cell viability was determined using the Alamar Blue assay.

Nanoscience Category

Nanoscience Poster 7:

Manipulation of Laporte selection rules in $CuAlO_2$ by alloying with iron

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Complex oxides, most notably perovskite material system ($A^{2+}B^{4+}O^{2-}_3$), are multifunctional materials that are finding a wide range of photonic and electronic applications. The delafossite oxide system ($A^{1+}B^{3+}O^{2-}_2$) is a much less explored with a wide range of possible alloy combinations that may have properties leading to novel applications. By using two site-B elements, quaternary ($AB^1B^2O_2$) alloys result. Not only does this increase the possible material combinations; it can introduce strain into the crystal, breaking the symmetry, and allowing optical selection rules (Laporte selection rule) to be bypassed. In this study, we explore the quaternary alloy, $CuAl_{1-x}Fe_xO_2$, with x=0.0 to 0.1. Powder samples are synthesized by solid-state reaction of mixtures of Fe_2O_3, Cu_2O and Al_2O_3 in a furnace at ~1,100ºC. Using x-ray diffraction, for x=0.1, we found the changes in the in-plane (*a*) lattice parameter increases by 0.55%, while the out-plane (*c*) lattice parameter increases by only 0.08%. UV-Vis spectroscopy measurements show both the direct and indirect optical band gaps shift to higher values, as the concentration of iron within the quaternary alloy increases.

Nanoscience Poster 8:

Measuring AC Stark shifts of quantum dot energy levels

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A confined electron spin within a quantum dot (QD) is a potential candidate to act as a quantum bit. Currently there is no method that allows for initialization, manipulation, and readout of the electron spin, all of which are necessary for a qubit. The driving hypothesis is that the AC Stark effect will allow for spin preserving cycling transitions, which can be used for single-shot spin measurements. The first objective is to demonstrate the AC Stark effect on QD energy levels, which can be studied and characterized via excitation spectroscopy. The preliminary results show that the AC Stark shift cannot be measured on neutral quantum dots without independent charge control. When the AC Stark laser is applied, the QD energy levels shift due to a change in the charge environment of the quantum dot that is not related to an AC Stark shift.

Nanoscience Category

Nanoscience Poster 9:

Development of a plasmon-enhanced near-infrared fluorescent nanoprobe for detection of cancer biomarkers

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Around 40% of world populations are diagnosed with cancer in a lifetime according to World Health Organization. Cancer is one of the leading causes of death, accounting for nearly one in six deaths worldwide. As an effective treatment of cancer proves highly challenging, the best practice of fighting cancer lies at early diagnosis. However, it remains a great challenge since the level of cancer biomarkers is very low at early stages. To address this issue, we have developed a plasmon-enhanced near-infrared fluorescent nanoprobe, consisting of a gold nanostar at the core, a silica shell, and near infrared (NIR) quantum dots (QDs), forming an Au nanostar@SiO_2@QDs nanoparticle. This nano-probe has several advantages. First, the nature of NIR fluorescence helps minimize background noise and maximize the penetration depth in biological samples. Second, the strong plasmonic field of Au nanostars helps improve the intrinsically weak fluorescence emission of NIR QDs dramatically, allowing a highly sensitivity. Third, the silica shell makes the nano-probe water-soluble. The nanoprobe obtained has a great potential application in early detection of cancers, especially in the precancerous stages, potentially saving many lives.

Nanoscience Poster 10:

Nanoparticle nucleation via atomic force microscopy

Landon Hall, Andrew Graves and Charter Stinespring
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Photodetectors have a wide assortment of uses, and with the highly tunable graphene nanoparticle composite photodetectors one can detect very specific wave lengths of light. This has applications for monitoring crop health and atmospheric mapping. These detector structures are typically created via e-beam lithography. This is a very time consuming and expensive process. A possible way to speed up this process is to “print” these structures using an atomic force microscopy (AFM) apparatus. By scanning the AFM in a liquid cell filled with a silver salt solution and applying a bias voltage between the tip and graphene surface, it is thought that the nucleation of silver particles will occur on the surface. These studies explore the feasibility of this process and investigate the effects of key parameters. These parameters include the distance between the tip and surface, concentration of the silver salt solution and scan rate of the AFM.

Nanoscience Category

Nanoscience Poster 11:

Simulation of plasmonic contact enhanced light emitting diodes

Merrik M. Malin[1,2], Casey Norville[2], Kyle Smith[2] and Jeremy Dawson[2]
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The use of light-emitting diodes (LEDs) offer improved energy-savings in many lighting applications. LEDs have gathered interest due to their low power consumption, and also because they can be engineered to tune their emission wavelengths to lie within the infrared, visible, or ultraviolet spectra. Despite the high levels of internal quantum efficiency (QE) achievable in LEDs, methods of enhancing external QE are being explored. One mechanism utilized for improving the external QE is the use of nano-patterned metal contacts. When the plasma frequency of a metal couples with the LED's emission wavelength, it can couple with surface plasmon polaritons creating a localized region of enhanced electric field density. If this high- intensity field is located in the vicinity of the multiple quantum wells (MQWs) of an LED, it will increase the emission rate of the MQWs via the Purcell effect. This work explores the FDTD simulation of enhanced emission (465nm) for a gallium nitride LED coated with a periodic plasmonic array of silver-filled nanoholes with the goal of further improving the internal QE of the LED.

Nanoscience Poster 12:

Harvesting waste heat for thermoelectric generation through addition of gold nanoparticles in oxide ceramics

James Penney, Xueyan Song, Cullen Boyle and Cesar-Octavio Romo-De-La-Cruz
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Thermoelectric generation is the process of converting heat directly into electricity through the Seebeck Effect. The Seebeck Effect occurs when two dissimilar conductive materials create a voltage difference from a temperature difference between them. This can be used to recycle energy from a multitude of areas such as the industrial sector and automobiles. The solution comes from complex metal oxide-based thermoelectrics that are stable in air and at high temperatures. The efficiency of these materials needs to be improved and is measured by their electrical properties, needing to be increased, and thermal properties, needing to be decreased. The goal is that the gold nanoparticles will reduce thermal conductivity by increasing phonon scattering while not affecting electrical properties. Samples of an un-doped material, Bismuth doped material, and these same materials doped with gold nanoparticles at different concentrations will be tested for electrical and thermal properties to be compared. Thus far, the addition of gold nanoparticles at concentrations of 0.5%, 1.0%, and 1.5% weight have slightly improved the electrical properties.

Neuroscience Category

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Neuroscience Category

Poster 14: Low-dose wearable PET imaging during ambulatory motion in humans.
Nanda Siva, Julie Brefczynski-Lewis, Chris Bauer, Alexander Stolin, Gary Marano Mary Beth Mandich, Thorsten Wuest, Samantha Melroy and Stan Majewski.

Neuroscience Category

Neuroscience Poster 1:

Identifying target genes of the homeobox transcription factor Gsx1 in zebrafish

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GS homeobox 1 (Gsx1) regulates the development of neurons for prepulse inhibition (PPI), a sensorimotor gating phenomenon disrupted in schizophrenia and ASD. However, the molecular genetic pathways underlying the development and function of Gsx1-expressing neurons across the central nervous system are not yet fully understood. Very few Gsx1 target genes have been identified in other model systems. However, they include genes implicated in proliferation, migration, and specification of neural progenitors. We hypothesize that genes implicated in neurodevelopmental disorders with PPI and other sensory processing deficits are targets of Gsx1. *In silico* analysis identified putative Gsx1 binding sites upstream of zebrafish orthologues of mammalian target genes as well as genes implicated in schizophrenia. We are thus examining the expression of these genes in wild type and *gsx1* mutant zebrafish by *in situ* hybridization. This work will validate that genes regulated by Gsx1 in mammals are conserved in zebrafish, and that genes implicated in schizophrenia are both direct and indirect targets of Gsx1.

Neuroscience Poster 2:

Effects of ambient room temperature fluctuations on C57BL/6 mice on sensori-locomotor behavioral outcomes

Hana K. Ulman,[1,6] Jessica M. Povroznik,[2,4,5] Elizabeth B. Engler-Chiurazzi,[2,4,5] and Candice M. Brown[3,4,5]
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In experimental rodents, fluctuations in ambient temperature impact basal physiological measures but less is known about the consequences on functional outcomes. To assess our hypothesis that ambient temperature fluctuations may impact behavioral results, C57BL/6 mice (n=25) were randomized to four temperature groups (59-61, 68-69, 72-74, 78-79 °F) and evaluated using a test battery (body weight, rectal temperature, open field, wire hang, grip strength, rotarod). The effect of portable heaters to ameliorate any behavioral impacts of temperature change was also evaluated. Ultrasonic vocalizations (USV) were recorded to measure temperature-related changes on affective function. Preliminary results suggest highly significant context-specific and sex-dependent differences associated with varying temperatures. Assessment of the number and duration, respectively, of USV revealed significant interactions between ambient temperature and sex (p=0.001; p=0.03). A significant interaction between sex and temperature was also observed for the wire hang test (p=0.005). Taken together, these data provide insight into possible temperature-induced variability observed during functional assessment, highlighting the experimental significance of maintaining environmental factors within biomedical research facilities.

Neuroscience Category

Neuroscience Poster 3:

Developmental expression of the non-clustered homeobox genes Gsx1 and Gsx2 in zebrafish

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The closely related *genomic screen homeobox* genes, *gsx1* and *gsx2*, encode transcription factors that are dynamically expressed throughout the developing central nervous system (CNS). Gsx1 and Gsx2 have coordinate roles in interneuron differentiation and show highly conserved spatiotemporal expression amongst vertebrates. Despite this, neither expression of *gsx2*, nor the expression of *gsx1* or *gsx2* across distinct CNS regions in *gsx1* or *gsx2* mutant zebrafish have been comprehensively analyzed. Consistent with reported expression in the embryonic mouse forebrain, we hypothesize that *gsx1* and *gsx2* play compensatory roles in the absence of one another through shifts in their normal dorsoventral expression domains. Using RT-PCR and *in situ* hybridization, we characterized expression of zebrafish *gsx2* and found that it starts at the onset of the segmentation period in a domain dorsal to *gsx1*. *gsx2* expression is restricted to the ventral diencephalon, telencephalon, caudal hindbrain, and spinal cord. Further investigation of the expression of *gsx1* and *gsx2* in mutants will elucidate the roles of these conserved and closely related transcription factors in neural development across the CNS.

Neuroscience Poster 4:

Examining visual neural circuit development and behavior in *gsx1* mutant zebrafish

Rebekah Shephard[1], Regina L Patrick[1,] Qing Bai[2], Enhua Shao[2], Edward A Burton[2], Sadie A Bergeron[1]
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Proper vision depends on the correct formation of neural circuits between the eyes and brain. Such visual ability can be assessed by measuring the optokinetic response (OKR), saccadic eye movements that stabilize retinal images while an organism is in motion. Additionally, *gs homeobox 1* (*gsx1*) is expressed in many developing brain regions, including the pretectum and optic tectum in zebrafish. However its role in the development of visual neural circuits has not been examined. We hypothesize that visually guided behavior and its corresponding neuroanatomy will be disrupted in *gsx1* zebrafish mutants. By 6 days post fertilization in the pretectum, *gsx1* mutant zebrafish have neurons as demarcated by anti-HuC/HuD antibody but lack normal glutamate expression. Additionally, the OKR of *gsx1* mutant larvae is impaired in our preliminary analyses. We continue to analyze axon connections to and neurotransmitter identity of neurons in the pretectum in *gsx1* mutant zebrafish using transgenic lines and immunolabeling. These studies will reveal novel roles for *gsx1* in the development and function of visual circuits.

Neuroscience Category

Neuroscience Poster 5:

Knockdown of the serotonin 2B receptor expression in olfactory receptor neurons of Drosophila

Andrew M. Steele and Andrew M. Dacks
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Serotonin (5-HT) is a neurotransmitter that has multiple sources throughout the body of organisms. 5-HT has many important roles in neurological function, and many diseases arise from impairments in these 5-HT-related functions. 5-HT derives from multiple sources, but it is difficult to separate the influences of each 5-HT source from another. For this project, we used the Drosophila olfactory system to determine the effects of blood-borne serotonin on odor coding via the olfactory receptor neurons (ORNs). Fruit flies detect odors with ORNs, which have a single serotonin receptor subtype called the 5-HT2B receptor. 5-HT can be either blood-borne or released in the brain, yet ORNs are likely to be only affected by blood-borne 5-HT. To look at the consequences of blood-borne serotonin on the peripheral nervous system (olfactory processing), we knocked-down the expression of the 5-HT2B receptor in the ORNs using a genetic tool and tested behavior using olfactory sensitivity experiments. Since the 5-HT2B receptor is excitatory, we predict that this will cause a lack of excitation in the ORNs, and therefore decrease sensitivity in the flies.

Neuroscience Poster 6:

Regulation of physiological responses and social stress: the effects of compassion meditation during stress paradigms in virtual reality

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Social conflict can be a source of severe stress and anxiety, and virtual reality (VR) could serve as a valuable tool to study such psychosocial interactions, providing advantages to live interaction such as variable and environmental control. It is unknown whether VR interactions can illicit similar physiological responses, or whether pro-social training techniques can translate to the virtual world. In this study, we examined responses during stress-inducing social confrontation in a virtual versus real environment, and tested whether responses changed with Compassion training. Subjects and trained confederates interacted in the form of 3 minute structured vignettes, while physiological responses (heart rate (HR), blood pressure (BP)) were measured. A subset of participants took part in a post-training interaction as well as a functional magnetic resonance imaging (fMRI) study to test brain responses to faces of the real and virtual disliked and neutral persons from the study (confederates) and real life. For the physiological study, early results confirm that VR and real interactions yielded comparable stress responses (*t*-test differences: systolic BP p=0.502, diastolic BP p=0.074, HR p=0.253). We hypothesize that fMRI results (still in collection) will further confirm a lack of difference between VR vs. live stress interactions, and that stress-induced physiological and brain activation will be dampened by compassion mediation. Such results would have implications for conflict training and stress management techniques.

Neuroscience Category

Neuroscience Poster 7:

Lipopolysaccharide-induced neuroinflammation is associated with increased depressive-like behavior

Kristen Pechacek and Cole Vonder Haar
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A common symptom of a traumatic brain injury is neuroinflammation, which has also been associated with depressive-like behaviors. Lipopolysaccharide (LPS) is a component of gram-negative bacteria that has been shown to cause activation of microglia and produce inflammatory cytokines when an animal is exposed to it. The current study investigated the effects of neuroinflammation caused by LPS on motivational behavior in rats. The progressive ratio task was used to assess the strength of these behaviors. After obtaining a stable baseline of behavior, (~30 sessions), rats received either acute doses (i.p. injection) or chronic administration (subcutaneous pump) and were re-assessed for behavioral changes. After dosages of 2mg/kg and 1mg/kg, a decrease in behavioral performance was shown. LPS administration resulted in reduced motivation, suggesting a major role for inflammation in depression.

Neuroscience Poster 8:

Utilization of thymidine analogs to analyze neuronal proliferation and migration during cortical development

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Two populations of neurons are essential for proper function of the cerebral cortex: glutamatergic excitatory neurons and GABAergic inhibitory interneurons. During development, these neurons migrate into the cortex from different locations and establish connections with one another that provide the foundation for brain function throughout life. Disruptions to these processes have been linked to disorders like autism, epilepsy, and schizophrenia. To understand how these disorders arise, we must first learn how excitatory and inhibitory neurons interact. Previously, our lab has found a role for the c-Jun N-terminal kinase (JNK) pathway in the migration of cortical interneurons. Here, we explore how the complete loss of JNK function from interneurons can disrupt excitatory neurons. We use acute pulse experiments with thymidine analogs to quantify cell cycle kinetics of cortical progenitor cells, and pulse-chase experiments to follow the migration of excitatory neurons born at two embryonic time points. These experiments will reveal whether loss of JNK signaling in interneurons impacts the proliferation and migration of excitatory neurons and provide insight into cell-cell interactions in the developing cerebral cortex.

Neuroscience Category

Neuroscience Poster 9:

miR-34a targets Cytochrome C and shapes stroke outcomes

Edward A. P. Provencher[2], Heng Hu[1,3], Stephanie Rellick[1], Imran Farooqi[1,2], Saumyendra N. Sarkar[1], Kimberly Grasmick[1,2] and Xuefang Ren[1,2,3].
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The blood-brain barrier (BBB) is a crucial interface between the central nervous system (CNS) and the circulatory system that maintains cerebral homeostasis by selectively allowing entry of blood solutes into the CNS. BBB dysfunction has been observed in neurodegenerative disorders such as stroke, and this has negative impacts on stroke outcomes. Mitochondria are key players in this process. We recently demonstrated that miR-34a regulates the BBB by targeting cytochrome c (CYC) *in vitro*. Using a murine transient middle cerebral artery occlusion model, we demonstrate elevated miR-34a expression in serum and primary endothelial cells (CECs) from stroke mice. We report that miR-34a deficiency significantly reduces BBB permeability, improving stroke outcomes. CYC is decreased in the ischemic hemisphere from wild-type but not miR-34a$^{-/-}$ mice following stroke reperfusion. Uncoupling of electron flow by the pharmacological inhibitor carbonyl-cyanide-4-(trifuoromethoxy)phenylhydrazone compromises mitochondrial oxidative phosphorylation in cultured CECs and worsens infarct volume in stroke mice. Our study suggests that miR-34a is a critical regulator in BBB permeability and mitochondria, and targeting miR-34a may be a potential therapeutic strategy for stroke.

Neuroscience Poster 10:

Categorical vs. graded perception of communication signals in weakly electric fish

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Electric fish are very helpful in researching the physiology of the sensory and central nervous system. Recent evidences indicated that at both the neural and behavioral levels, weakly electric fish's communication signals -namely chirps- can be processed either to discriminate specific details in the signals or, on the contrary, only allow for the detection of the signal. In this study we ask whether these different processing strategies, categorical perception versus graded perception, are observed across related species of electric fish. Perceptual abilities of three species of Apteronotids was compared by submitting them to a habituation-dishabituation behavioral test. Our results indicate that some species perceive their communication signals primarily in a categorical, detection manner, while other species have the ability to discriminate fine variation, such as elapsed time, in the signals. We discuss how species-specific difference in communication signals structure and social behavior could explain our results.

Neuroscience Category

Neuroscience Poster 11:

Positive allosteric modulation of CB_1 attenuates Δ^9-THC withdrawal

Emily Silvestri[1], Kristen R Trexler[2], Hunter Aliff[3], Sara R Nass[2], Matthew L Eckard[2] and Steven G Kinsey[2]
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Although cannabis withdrawal is characterized by drug craving, sleep disturbances, and changes in emotion, animal models focus almost exclusively on somatic withdrawal signs. In the present study, in addition to somatic signs, multiple behaviors relating to motivation and emotion were also evaluated, with the goal of better modeling human cannabis withdrawal symptoms. ZCZ011 is a CB_1 cannabinoid receptor positive allosteric modulator (PAM) that increases the activity of CB_1 agonists. We hypothesized that ZCZ011 attenuates THC withdrawal in mice. Mice were treated with THC (10 mg/kg, s.c.) or vehicle for 6 days, and withdrawal was precipitated using the CB_1 antagonist rimonabant (3 mg/kg, i.p.). ZCZ011 (40 mg/kg, i.p.) significantly attenuated somatic withdrawal but had no effect on marble burying or struggling in the tail suspension test. ZCZ011 dose-dependently induced immobility. Results of this study indicate that ZCZ011 blocks THC withdrawal-induced somatic withdrawal signs, but sedation may be a confound when using higher doses. Positive allosteric modulation of CB_1 is a novel strategy to reduce cannabis dependence.

Neuroscience Poster 12:

Modeling kinematics and dynamics of movement from transcranial magnetic stimulation data

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The central nervous system and its control over limb movement are currently being investigated to understand how the brain achieves accurate movements under diverse dynamic conditions. Thus, gaining knowledge in limb dynamics of the musculoskeletal system using quantification methods may be beneficial in understanding neurological control of the limb in both healthy and pathological states. In this study, inverse kinematics and dynamics models of the arm were constructed using Matlab's Simscape Multibody to approximate kinematics and dynamics of arm movement. Experiment participants were defined specific movements to execute while under stimulation of the motor cortex from transcranial magnetic stimulation (TMS). The recorded motion capture data was simulated through the inverse kinematics model to provide joint angles for specific arm joints. These joint angles were subsequently simulated through the inverse dynamics model to provide torques of the joints. Preliminary results have successfully approximated joint angles and torques that appear consistent with subject movement. Full comprehension of these limb dynamics through modeling may be useful for clinical applications involving prosthetics or neurological impairments.

Neuroscience Category

Neuroscience Poster 13:

Serotonin and its role in olfactory sensory-driven behavior in *Drosophila melanogaster*

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Serotonin is an important neurotransmitter used by almost all animals. It is of great behavioral relevance, as it has been linked to modulating things such as mood, gastrointestinal activity, memory, and even sleep. As there are many behavioral conditions that result from improper serotonin signaling, it is important for us to investigate the role of serotonin in the brain, and how it modulates neural networks. Unfortunately, serotonergic systems in mammalian models are far too complex to study how individual classes of serotonergic neurons function. *Drosophila* is a great model system to study the effects of serotonin on olfaction, as we can specifically target the only two neurons that supply serotonin to the primary olfactory processing center, the CSD neurons. By comparing normal fly behavior to flies with upregulated and downregulated CSD signal, the function of serotonergic modulation in olfactory processing can potentially be deduced. While data collection is ongoing, it suggests that serotonergic modulation of olfaction might play a role in increasing odorant sensitivity under highly concentrated odor conditions.

Neuroscience Poster 14:

Low-dose wearable PET imaging during ambulatory motion in humans

Nanda Siva[4], Julie Brefczynski-Lewis[1], Chris Bauer[1], Alexander Stolin[3], Gary Marano[3], Mary Beth Mandich[5], Thorsten Wuest[6], Samantha Melroy[6] and Stan Majewski
[1]Department of Physiology and Pharmacology, [2]Blanchette Rockefeller Neurosciences Institute, [3]Department of Radiology, [4]Department of Biomedical Engineering, [5]Department of Physical Therapy, and [6]Department of Industrial Management Systems, West Virginia University, Morgantown, WV 26506

A goal in neuroscience is understanding human brain behavior during everyday situations; however, current imaging modalities are ineffective at representing deep brain structures during motion. Thus, our group has developed a wearable Positron Emission Tomography(PET) brain scanner, co-registered with human head movement, that measures metabolic activity levels in different brain regions. The imager consists of 12 silicon photomultiplier modules in a lightweight 21 cm ring and requires a low dose F^{18}-FDG (glucose-analog). In this study, brain images taken while patients were performing simple physical tasks (such as walking in place or tapping their foot) display noticeable activity differences in the basal ganglia, thalamus, and occipital lobe. Additionally, analysis of dynamic PET data shows the uptake of glucose over time. Future investigation will involve comparison of produced images to patients' clinical PET scans and imaging of subjects participating in social interactions. The scanner has potential applications in medical research, for instance monitoring brain plasticity during patient stroke recovery or diagnosing/evaluating brains of patients who struggle to remain stationary such as those with dementia or epilepsy.

Non-STEM Category

Non-STEM Category Index:

Non-STEM Category

Non-STEM Poster 1:

The differential roles of patriotism and nationalism in political engagement

Kiara J. Cogar and Natalie J. Shook
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With the results of the 2016 Presidential election, there has been a renewed interest in the roles of patriotism and nationalism in U.S. politics. Patriotism refers to "attachment and goodwill towards one's country," whereas nationalism refers to viewing one's country as superior to others. Although patriotism and nationalism are often positively correlated against one another, they do differentiate in some important ways (e.g., patriotism is a significant correlate of political engagement, whereas nationalism is not). The purpose of this study was to further differentiate patriotism and nationalism in their relationship with different forms political engagement. Political engagement was measured four ways: 1) political activity, 2) political values, 3) exposure to political news and discourse, and 4) voting. We found that patriotism was positively correlated political values, exposure to political news and discourse, and voting ($p<0.01$). Nationalism negatively correlated with political activity ($p<0.05$), and positively correlated with the political values ($p<0.05$). Thus, patriotism and nationalism are differentially related to political engagement, which has implications for political activities, such as voting.

Non-STEM Poster 2:

Athletic identity and the transition from Division 1 football: from athlete to adult

Mykal Manswell and Scott Barnicle
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Identity is how one views themself within multiple roles. Athletic identity is a key factor in multiple areas in a student-athlete's career however, athletic identity is both fragile and critical simultaneously, effecting things such as self-confidence, self-identity, and reputation around campus. Through qualitative interviews with ten football players at a Mid-Atlantic Division 1 University, data was gathered examining interests outside of the sport, their process of becoming a division one athlete, and preparation for life after football. Primary findings explored common trends among the participants such as having support systems, the use of applied sports psychology skills such as goal setting and motivation, and having ideas on creating useful career opportunities for themselves. Additional results suggested participant student-athletes have a solid sense of who they are but do not have a stable outlet for who they want to become outside of sport. The significance of the study is that it can inform universities that student athletes not only desire innovative methods for career development, but also have diverse ideas of their own.

Non-STEM Category

Non-STEM Poster 3:

Cultural perceptions of cancer among college-educated populations in north central West Virginia

Jacqueline Spiropoulos, Susanna Donaldson and Ann Morris
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For many years, West Virginians have experienced suboptimal health outcomes, including above average cancer mortality rates. Previous anthropological studies suggest that cultural factors in low-income, uneducated populations may explain this phenomenon. However, few studies have examined cultural factors in college-educated populations. In this pilot study, we interviewed college-educated Morgantown residents to better understand their perceptions of cancer. We asked informants to create lists based on four prompts (i.e. "List all of the words or phrases that you think of when you hear the word cancer") and then explain their lists in detail. Preliminary results indicate that while college-educated populations accept the biomedical treatment approach, they maintain relatively negative perceptions of biomedical cancer treatments such as chemotherapy and radiation and express little faith in the long-term success of these treatments. Although the initial goal of this project was to test our method and collect baseline data, we believe that further study is necessary within this demographic. Our findings suggest a need for further research on health-based decision-making and its relation to socio-economic class.

Non-STEM Poster 4:

Discovering the best consumer complaint strategies to gain compliance from financial institutions

Natalie Marquart, Farnoush Reshadi and Paula Fitzgerald
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The Consumer Financial Protection Bureau (CFPB) is the newest of federal agencies that provides a governmental check to ensure financial institutions are correctly implementing the rules and regulations of the industry. This study is looking at consumer credit card complaint narratives filed with the CFPB. The best persuasion tactics will be identified that lead to the best outcome when consumers are dissatisfied with a financial service. Various persuasion strategies will be examined based on the sales, promotion, and justice literatures using NVivo. Additionally, LIWC, a computerized text analysis tool to identify effective themes will be used. Within the findings, consumers use a wide variety of strategies, from expressing negative emotions, identifying certain legal regulations, and reminding firms of the consumer's loyalty. Traditionally, marketing scholars have studied how companies strategize to persuade consumers to purchase their product. This study is of significance because it looks at how consumers are trying to persuade the company to act in their favor.

Non-STEM Category

Non-STEM Poster 5:

Capitalizing off collapse: the hidden alpha within the 2008 Financial Crisis

Nathan Burks[1], Bingxin Li[1], John Bowling[2] and Natalia Schmid[2]
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The 2008 Financial Crisis resulted in economic anomalies that largely caused fundamental equity market microstructure to cease normal function. A major component in the origination of this market dysfunction can be ascribed to pervasive illiquidity. Illiquidity can be rudimentarily defined as a condition when an asset cannot be easily sold without incurring substantial loss in value. In this study, we investigate how systemic illiquidity can adversely affect a mean-reverting statistical arbitrage strategy through the development of a trading algorithm. Statistical arbitrage is essentially a convergence trade entailing the purchase of an undervalued security, while simultaneously selling an overvalued security of a similar nature. A trader is projecting that the prices of the two securities will converge and produce a theoretically riskless profit. However, historical analyses of statistical arbitrage tactics during the 2008 Financial Crisis indicate that massive losses were suffered in this period. The algorithm we have designed will incorporate liquidity-based risk metrics to enhance the alpha-generation potential of our specific arbitrage strategy. Preliminary results suggest discrepancies between traditional and liquidity-adjusted algorithmic portfolio optimization.

Non-STEM Poster 6:

Machine learning in statistical arbitrage: forecasting the market to succeed during financial crisis

John S. Bowling[1], Nathan D. Burks[2], Bingxin Li[2] and Natalia A. Schmid[1]

[1]Lane Department of Computer Science and Electrical Engineering and [2]Department of Finance, West Virginia University, Morgantown, WV, 26506-6045

Statistical arbitrage is the application of exploiting anomalies in the pricing of one or many assets based on the forecasted value of these assets. In this research, we explored the implementation and benefits of machine learning algorithms to statistical arbitrage. This research sought to provide a comprehensive overview of statistical arbitrage and its potential risks. Our experimental strategy consisted of exchange traded fund (ETF) arbitrage by shorting and longing the ETF or its respective component stocks. Further, principal component analysis was utilized to reduce the dimension of feature space within the ETF dataset. We applied an autoregressive prediction model to the daily closing prices of the Financial Select Sector SPDR Fund ETF, or XLF, to commit arbitrage between the XLF and its component stocks. The algorithm was backtested with historical data from the 2008 Financial Crisis for analysis of its performance under extreme stress. Our algorithm yielded higher profits than similarly published strategies, and additionally proved the existence of alpha within the economic downturn of 2008.

Non-STEM Category

Non-STEM Poster 7:

A changing cultural landscape in the Sunnyside neighborhood of Morgantown, West Virginia

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Although known in recent memory as a popular party location for students, prior to the mid-twentieth century, Sunnyside was home to a diverse population. As a primarily working class neighborhood, Sunnyside provided affordable housing, social outlets for permanent and transient populations, and proximity to one's workplace, campus, and downtown Morgantown. In the past thirty years, as West Virginia University's student population grew, student housing demands significantly altered Sunnyside's historic building stock. Since 2013, graduate students in West Virginia University's public history program have researched over thirty Sunnyside properties including factories, businesses, houses, and social institutions. We edited and compiled these narratives into a concise, thematic document for public consumption, with historic and current photographs and a map to help the reader better understand the scope of the neighborhood. This study provides a foundation for future research about the area and its residents, preserves many fascinating Sunnyside narratives, which is critical considering current and future real estate development, and serves as an example for other historic communities that struggle to coexist with increasing student populations.

Non-STEM Poster 8:

A closer look at critical consciousness: does it function differently in Appalachian adolescents?

Shannon Underwood, Lauren Alvis and Aaron Metzger
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Critical consciousness—the understanding of how systems of oppression persist in society—and its affects on adolescent political behaviors has been researched in the past, but critical consciousness has not been looked at with social responsibility values, nor has critical consciousness been examined in an Appalachian population. Understanding the association between critical consciousness, social responsibility values and political efficacy among different marginalized populations will provide unique insights into the ways in which culture and geography differentially influence the development of political efficacy. Participants were 998 adolescents aged 10-20 years old that completed a survey. Consistent with hypotheses, both social responsibility and critical consciousness were positively associated with political efficacy. Furthermore, in the Appalachian subsample, social responsibility values moderated the association between critical consciousness and political efficacy. Critical consciousness was positively associated with political efficacy for Appalachian adolescents with low levels of social responsibility but not for Appalachian adolescents with high social responsibility. Findings indicate that critical consciousness may function differently as a predictor of political efficacy in an Appalachian population versus other marginalized populations.

Non-STEM Category

Non-STEM Poster 9:

Revising sociolinguistic research methodology for the West Virginia Dialect Project

Em Hough and Kirk Hazen
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A chief concern of sociolinguistics is the interplay between language and culture, which inherently entails a conversation surrounding power dynamics associated with language variation. The West Virginia Dialect Project's (WVDP) current study takes up this question in the context of the dialect of English produced in West Virginia and has conducted numerous studies and published multiple highly influential papers on the subject. Traditional sociolinguistic methodology and data analysis has frequently been painstakingly slow and at times difficult to collect and record in an organized, expedient fashion. The WVDP has developed a new model with the intention of streamlining the data collection process for its upcoming project that focuses on the relationship between West Virginian eighth graders' language and social identities. We are switching from a program called PRAAT to ELAN, both linguistic analysis softwares, as ELAN allows us to export data straight to excel spreadsheets to speed up the process and reduce statistical errors. ELAN allows for pre-programmed templates that significantly cut down on the amount of time lab workers will require to complete their analysis.

Non-STEM Poster 10:

People floating in midair: towards a new expressive figuration in painting

Patrick J Bayly
College of Creative Arts, West Virginia University, Morgantown, WV 26506-6045

I arrived at this point after thinking about a leaf as a unit that describes, through variations in its physical form, the unfolding space occupied by a plant and began to paint portraits as an investigation of the human form. Inspired by Édouard Manet's *Boy Carrying a Sword* (1861) to distill painting into a signature expression of light, to reduce composition to its subject, and to seek concision of brushwork, I have moved from representation as a goal in and of itself to communicate new ideas. The bat in *Young Woman Leaning on Her Father's Old Baseball Bat* (2017) is painted on the ledge of the podium as an offering to the viewer, as a key to the meaning of the painting, which cannot be grasped. These paintings of people made by one unfold into spaces of philosophy, culture, and politics towards a new expression of the human form.

Physical Sciences Category

Physical Sci Category Index:

Physical Sciences Category

Physical Sci Poster 1:

Synthesis of copper carboxylate complexes for decarboxylation

Justin J. Steets, Aaron P. Honeycutt and Jessica M. Hoover
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Decarboxylative coupling reactions are a green way to form C-C, C-N, C-O, C-S, and C-P bonds because the use of carboxylic acids as coupling partners eliminates the need for adding organometallic reagents to the reaction. The decarboxylation of a broad scope of carboxylic acids is made possible by using copper salts. Most transformations however require harsh conditions (up to 210°C) for the decarboxylation to occur. One way to get the reaction to run at lower temperatures and less harsh conditions is to synthesize different complexes with new ligands that enable that kind of reaction. Here, we report a new copper carboxylate complex bearing an electron-rich tripodal ligand. We hypothesize that this ligand will allow for lower temperature decarboxylation by stabilizing the copper aryl or copper alkyl intermediate. This presentation will focus on the synthesis and characterization of the copper carboxylate complexes as well as the preliminary results of the decarboxylation reactions.

Physical Sci Poster 2:

The DARTH laboratory reconnection experiment: scientific aims and diagnostic development

Andrew J. Jemiolo and Earl E. Scime
Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506

Magnetic reconnection is the breaking of magnetic field lines and the consequent change in magnetic topology. During this process, there is a conversion of magnetic energy to kinetic and thermal energy when field lines of opposite polarity merge. Magnetic reconnection is responsible for several space plasma phenomenon, such as solar flares and coronal mass ejections, the aurorae on earth, and is an important process in thermonuclear fusion experiments. To experimentally test magnetic reconnection in a lab, we are constructing DARTH (Diagnosis of Acceleration, Reconnection, Turbulence, and Heating). A key aspect of DARTH is the extraordinary access for advanced diagnostics, including: laser-induced fluorescence (LIF), which is a non-perturbative method for measuring ion velocity distribution functions, a 300 GHz microwave scattering system for turbulence measurements, and a Thomson scattering diagnostic for electron velocity distribution function measurements. We will present our initial experimental designs and describe the state of the construction of the facility.

Physical Sciences Category

Physical Sci Poster 3:

Nickel catalyzed decarboxylative cross coupling reaction by a silver intermediate

Sierra Ciccone and Jessica Hoover
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506

Decarboxylative cross coupling reactions are an effective way of producing C-C bonds; therefore, they have broad applications in synthetic and medical chemistry. While copper and palladium catalyzed reactions have been well studied, nickel has recently become a metal of interest for being inexpensive and for its potential to work with a broader range of substrates. In this study, the decarboxylation step and the transmetalation have both been investigated. Thermal, nickel catalyzed, and silver catalyzed decarboxylation reactions were set up. It was observed that the rate of the thermal and nickel catalyzed decarboxylation were much slower than that of the silver catalyzed reaction. This data suggests that silver is responsible for catalyzing the loss of the carboxyl group while nickel has no significant chemistry here. To further investigate the cross coupling, the proposed silver aryl species by which the reaction is thought to proceed was synthesized. It is predicted that the desired product will be produced in yields comparable to that observed under optimized conditions, supporting the proposed mechanism involving the silver aryl intermediate.

Physical Sci Poster 4:

Gas phase kinetics of CH radical reactions with five-membered cyclic molecules

Connor McCormick, Kacee L. Caster and Fabien Goulay
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Morgantown, WV 26506-6045

The reactions of CH radicals with unsaturated five-membered ring molecules are believed to proceed via cycloaddition across the double bond to form six-membered rings such as benzene and pyridine. The formation of these molecules is the first ring cyclization toward the formation of polycyclic aromatic hydrocarbons (PAH). PAHs are abundant in combustion environments and are the precursors to soot, an unwanted combustion by product. In these studies, CH radical reactions with five-membered ring molecules are investigated both experimentally and computationally. CH radicals are generated via pulsed laser photolysis (PLP) of bromoform ($CHBr_3$) and are detected by laser-induced fluorescence (LIF). Pseudo-first order kinetics are used to determine the rate of reaction of CH radical with cyclopentadiene. Previous calculations using CBS-QB3 composite method suggest that the expected product of this reaction is benzene. Using Gaussian09 software and CBS-QB3 composite method, the reaction pathway of CH insertion and CH cycloaddition into pyrrole is also investigated with pyridine being the expected product. Further studies will investigate this reaction using the PLP/LIF method.

Physical Sciences Category

Physical Sci Poster 5:

Revisiting zirconocene complexes for use as molecular photosensitizers

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Transition metal photosensitizers have been a prominent topic due to their importance in photovoltaic cells and photoredox catalysis. Currently available technology relies heavily on the use of precious metals, which limits the potential for large-scale applications due to the low abundance and high cost of the metal precursors. Earth abundant zirconium was chosen as a low-cost alternative to precious metals because cyclopentadienyl zirconium chalcogenolates have been reported to exhibit photoluminescent properties. However, these complexes lack the ability to undergo reversible electrochemical processes, which is a required property for solar energy conversion. Inspired by previous studies, we are trying to develop zirconium complexes with a mixed ligand system of cyclopentadienyl (Cp) and a redox non-innocent ligand, such as catecholate or benzenedithiolate. We hypothesized that the combination of these ligands would result in compounds with favorable optical and electrochemical properties for applications in solar energy conversion or photoredox chemistry. Despite several different synthetic strategies, our attempts to prepare Cp_2Zr catecholate were unsuccessful due to uncontrolled pathways leading to complex product mixtures. The synthesis of Cp_2Zr benzenedithiolate has proven to be clean and studies of its photophysical and electrochemical properties are currently underway.

Physical Sci Poster 6:

Assessment of the validity of duct tape end matches in forensic comparisons

Aaron N. Brake, Meghan Prusinowski and Tatiana Trejos
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Forensic tape examinations can determine whether or not two items came from the same source. Typically, similarities in the chemical and physical features can provide class characteristics. However, the identification of a fracture match between two (or more) tape pieces has a stronger probative inference as it demonstrates they were once part of the same roll. These conclusions rely on the examiner's opinion to identify distinctive features across the tape ends, hence the evaluation of the objectivity, validity and accuracy of such conclusions is a critical need. In this study, the occurrence of false positives and false negatives was investigated for 200 hand torn and scissor cut samples, and an approach was developed to qualify and quantify the observed features. Random numbers were assigned to create 1008 blind comparison pairs. The samples were examined independently by two examiners. Five level features were qualified to determine if the pair was a match, non-match or inconclusive. Accuracy of the conclusions was 99.6%, with 0% false positives and 1-2% false negatives depending on the analyst and separation method.

Physical Sciences Category

Physical Sci Poster 7:

How temperature affects the weathering of gasoline

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Arson investigations are often influenced by identification of ignitable liquid residues (ILR) in fire debris. ILR analysis is most commonly achieved through headspace extraction, isolating vapors above the sample, followed by gas chromatography mass spectrometry (GC/MS). Previous research has shown that as ILs evaporate, or weather, the most volatile components evaporate first, resulting in a relative increase in concentration of the remaining substances. Recent work has shown that the temperature at which weathering occurs influences relative evaporation rates of different substances, and so, has a major effect on the distribution of weathered residues. This project will expand on the previous findings by evaporating a simplified synthetic mixture of gasoline in a quantitative manner at higher temperatures than has been previously reported. Current findings appear to corroborate the previous results and mathematical model, which show that a residue weathered to a high percent at a high temperature more closely resembles a residue weathered to a somewhat lower percent at room temperature. This contradicts traditional crime laboratory practices of comparing similar percent weathering, achieved at different temperatures.

Physical Sci Poster 8:

Mechanisms of the skunking process of beer introduced to light

Sydney Giles, Olivia Pavlic, Pedram Tavazohi and James Lewis
Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506

Beer contains alpha acids, with the three most predominant ones being humulone, cohumulone, and adhumulone. During heating when brewing beer, the alpha acids are isomerized, leaving iso-humulone, iso-cohumulone, and iso-adhumulone in their places, with two stereoisomers for each. When exposed to ultraviolet light, each species reacts to form radicals via a Norrish type I alpha cleavage of their acyloin group. Radicals then react with sulfur-containing species in beer to produce 3-methyl-2-butene-1-thiol (MBT), also known as "skunky" thiol, the compound responsible for the undesirable smell and taste of "skunked" beer. Due to little evidence, the exact mechanism is unknown, with two possible pathways for the cleavage of the involved side chain. Using a local-orbit ab-initio tight binding molecular dynamics code, FIREBALL, we seek to simulate the photoreaction of each iso-alpha acid in order to determine the most likely cleavage pathway and the total time the photoreaction takes to occur. Preliminary results suggest that the cleavage of the acyloin group is most probable on the same side of the ketone as the hydroxyl group.

Physical Sciences Category

Physical Sci Poster 9:

Mild synthesis of novel boron-based pharmaceutical candidates by copper catalysis with CO_2

Natalie R. Ziemer and Brian V. Popp
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506-6045

For most people, Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), such as Ibuprofen (Motrin®) and Naproxen (Aleve®), can be effective; however, for people with chronic pain, NSAIDs can cause gastrointestinal and rental issues if taken for an extended time. Recently the Popp group developed a new way to make the core of an NSAID that also allows the installation of boron. Boron-containing compounds are undeveloped and research in medicinal boron chemistry is promising in drug discovery. The group extracted the protocol to include several novel Bora-NSAIDs such fenoprofen. This was prepared in a two-step synthesis starting with the aldehyde precursor and phosphonium reagent which resulted in a vinyl group. Then, in a single reaction, the product was subjected to a copper catalysis forming new C-C and C-B bonds in perfect regioselectivity. The reactions proceed in good to excellent yields on a half gram scale. Further elaboration of the products were achieved through an electrophilic fluorination of the C-B bond as well as generation of a novel heterocycle salt in good yields.

Physical Sci Poster 10:

Adaptive biasing force simulations of the helix-coil transition of pH (low) insertion peptide

Emily Ankrom and Blake Mertz
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506

Developing a mechanism for targeted delivery of therapeutics to cancerous tissues and other sites of inflammation is a major aim of biomedical research. In an acidic environment, pH (low) insertion peptide (pHLIP) is able to bind and insert into cell bilayers to form a stable transmembrane α-helix. The acidity of inflammatory sites allows for pHLIP's binding and insertion properties to be exploited in developing a targeted drug delivery mechanism. The precise conformations of pHLIP in solution, during binding and during insertion must be revealed in order to optimize its ability to perform as a disease targeting agent. Molecular dynamics simulations of pHLIP in solution are employed to understand the energetics of these processes. To deduce the change in Gibbs free energy as pHLIP transitions from an α-helix to a random coil, Adaptive Biasing Force (ABF) simulations were performed. ABF simulations are advantageous because they allow for exploration of the free energy landscape of the coil-to-helix transition on timescales much faster than equilibrium molecular dynamics simulations. This reversible transition is one of the components of a proposed thermodynamic cycle used to characterize the function of pHLIP. Thus, we will be furthering our fundamental understanding of how pHLIP can be optimized for eventual clinical applications.

Physical Sciences Category

Physical Sci Poster 11:

Development of nanogel based protein characterization to diagnose and treat disease through bioanalytical separations

Shannon M. Patberg, Corey Cleavenger, Cassandra Crihfield and Lisa Holland
C. Eugene Bennett Department of Chemistry, West Virginia University, Morgantown, WV 26506-6045

Proteins are critical biomarkers that aid in the detection and diagnosis for the treatment of diseases such as cancer. Current methods such as the Western Blot are labor intensive with substantial preparations during each stage that engulf large amounts of time and resources, yielding inaccurate results. Using a newly developed method from the Holland Lab, proteins are easily analyzed within minutes through cost effective capillary electrophoresis methods with precise, rapid analysis. The proteins are sieved, a technique previously applied for DNA analysis. Sieving enables the instrument to separate in a size selective phospholipid nanogel and prevent protein absorption to the capillary wall. Through spiking studies of the dye, the validated method confirms the detection of proteins. The results allow for the compilation of an anionic and cationic protein library that allow for binding analysis with antibodies. These antibody-protein complexes are ultimately the technique that will allow for disease detection

Physical Sci Poster 12:

8-step synthesis of neoprofen a derivative of Ibuprofen

Perez Youmbi, Paratchata Batsomboon, Alexa Martin, Harvey Fulo and Gregory Dudley
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Neopentylene rings are found in most natural products but are lacking in pharmaceutical product. The focus of this research is to affectively synthesize neoprofen using a faster synthesis process than previous research. Neoprofen is a derivative of Ibuprofen, which is a well-known cyclooxygenase-2 (CO-2) inhibitor with the addition of a neopentylene ring. It was hypothesis that neoprofen would provide different interaction with COX-2 the enzyme responsible for inflammation and pain which would differ from Ibuprofen. The approach taken to synthesize neoprofen is an 8-step synthesis to neoprofen. The preliminary findings showed a percent yield greater than 85% in the first 7-steps of the synthesis. These results are slightly below the anticipated yield which was greater than 95%. The first 7 step worked perfectly with all reaction going to full completion. Overall, at the end of the research, we hope to have develop a faster efficient way to synthesize neopentylene into ibuprofen and eventually into different drugs.

Physical Sciences Category

Physical Sci Poster 13:

Lysine location within Alzheimer's protein sequence reveals correlation to structure and membrane toxicity

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Alzheimer's disease is caused by the protein beta amyloid. This protein has a sequence that ranges from 40-42 amino acids in length and maintains a U-shaped structure containing beta sheets, a hydrophobic core, and a salt bridge. There are multiple proposed toxic mechanisms beta amyloid expresses to cause the symptoms of Alzheimer's disease. This study specifically focuses on the mechanism involved with lipid membrane disruption, which causes cell death. Our current hypothesis claims that lysines are significant in the formation of the peptide and overall toxicity due to their specific location within the amino acid sequence of beta amyloid. In order to test their importance, the overall charge of the lysine was altered by incorporating different concentrations of the molecule sulfosuccinimidyl acetate, a process known as acetylation, in solutions with and without lipids. Preliminary results suggest an indirect relationship between the amount of acetylation and beta sheet formation as well as a shift in the lag phase in solutions without lipid. However, in solutions with lipid show only changes in lag phase.

Physical Sci Poster 14:

Progress toward total synthesis of marinoquinolines A-C

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The marinoquinoline family of compounds has potential to serve as medicines of the future. The marinoquinolines are a family of alkaloids that were isolated from a marine gliding bacteria, O. kribbensis, off the coast of the Korean peninsula. Preliminary results from the isolated group showed a variety of medicinal properties including antibacterial, anti-cancer, and anti-protozoal applications. The total synthesis of marinoquinolines A-C is being explored, and the proposed pathway includes such as reactions as base-catalyzed cyclizations, reductions, Grignard reactions, and palladium catalyzed cyclizations. Currently, both marinoquinolines A and C have been synthetically prepared; marinoquinoline B, however, has not yet been synthesized. The techniques and methodologies studied are expected to be applied to all three marinoquinoline derivatives, and if successful, all syntheses would feature a palladium-catalyzed reductive cyclization developed in the Söderberg lab as a key transformation.

Physical Sciences Category

Physical Sci Poster 15:

Optimization of confocal laser induced fluorescence with comparisons to conventional optics

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Laser induced fluorescence (LIF) is the workhorse diagnostic for measuring ion and neutral particle velocities and temperatures in a plasma. The conventional method requires multiple intersecting optical access ports that are unavailable in many experiments or in plasmas contained by opaque walls. Confocal LIF, in which the injection and collection paths are concentric, eliminates the need for intersecting optical paths, allowing the diagnostic to be deployed through a single window or into channels with opaque walls. While confocal measurements at short distances are common, it has been a challenge to demonstrate high resolution at the focal lengths needed for many plasma experiments. We report optimized, confocal laser induced fluorescence measurements in a helicon plasma. These optimizations combined aberration mitigating optics with spatial filtering to achieve focal lengths that allow measurements deep within large vacuum vessels. We demonstrate comparable spatial resolution to the conventional method at a focal length of 0.5 m, multiple centimeters longer than previous tests of the diagnostic. The conclusions will compare data from conventional and confocal methods with insights from optical modeling.