Council on Undergraduate Research

22nd Annual Posters on the Hill

April 18, 2018

Rayburn House Office Building
Washington, DC

Dear Posters on the Hill Attendees:

Congratulations to all of our undergraduate researchers on their selection to participate in the 2018 Posters on the Hill. This is our 22nd annual Posters on the Hill event and follows the eighth annual Undergraduate Research Week, held from April 9-13, 2018.

As is the case every year, students' research projects went through a rigorous, highly competitive review process and were selected as the best from around the nation. We at the Council on Undergraduate Research (CUR) are very impressed by their accomplishments and are pleased that they have been able to come to Washington, DC, to participate in this prestigious event.

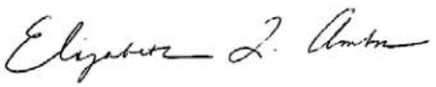
We are also proud of the faculty advisers and mentors who, with their students, serve as stellar examples of the best in higher education. In addition, we are pleased to partner with the American Chemical Society (ACS) for Posters on the Hill and are deeply grateful to ACS for its support of this event. ACS, a premier nonprofit organization and the largest scientific society in the world, is a global leader in chemistry education, research, and advocacy. Since CUR's inception in 1978, CUR has benefited from its association with ACS and appreciates the opportunity to continue our connection through Posters on the Hill, as well as other endeavors.

We know that the undergraduate research experience has contributed positively to the value of these students' undergraduate education and that they will be better prepared as a result for their careers, postgraduate studies, and the future.

To our students, we wish you every success as you continue your research and your studies. I have no doubt that you will help advance knowledge through your research discoveries. All of you will find that, whether you pursue a career in academia, business, industry, or public service, your undergraduate research experience adds significantly to your professional preparation. Perhaps someday you will be a member of the Council on Undergraduate Research and come to Washington, DC, when one of your students presents his or her research at Posters on the Hill. Or perhaps your path may take you to elected office, and you will be a Member of Congress and attend Posters on the Hill!

To all, please enjoy viewing the posters and speaking with these incredible students and their mentors during this special event. It is not an exaggeration to say that they are the future of our nation.

Best wishes,



Elizabeth L. Ambos
Executive Officer

The following posters will be presented on April 18, 2018
5:15-7:30pm-Rayburn Office Building Café, Room 2068

Alaska

Student: Jessica Obermiller
Research Institution: University of Alaska Fairbanks
Display Area: 1, Abstract page #10

Alabama

Student: Angela R Burke
Research Institution: University of Alabama in Huntsville
Display Area: 2, Abstract page #10

Arizona

Student: Lindsey Anne Chew
Research Institution: University of Arizona
Display Area: 3, Abstract page #11

Arkansas

Students: Brenna Corinne Frandson and Ayushi Saxena
Research Institution: Florida Institute of Technology
Display Area: 4, Abstract page #11

California

Student: Jessica Rush
Research Institution: Chapman University
Display Area: 5, Abstract page #12

Student: Aditi Newadkar
Research Institution: University of California, Los Angeles
Display Area: 6, Abstract page #12

Student: José Antonio Flores Velazquez
Research Institution: California State Polytechnic University, Pomona
Display Area: 7, Abstract page #13

Colorado

Students: Anna Hessler, David Thomas Radke, and Nick Crews
Research Institution: Colorado College
Display Area: 8, Abstract page #13

Connecticut

Student: Trent Lee Thompson
Research Institution: Sacred Heart University
Display Area: 9, Abstract page #14

Student: Tess E Candler
Research Institution: Eastern Connecticut State University
Display Area: 10, Abstract page #14

Delaware

Student: Jeremy J Wirick
Research Institution: Wesley College
Display Area: 11, Abstract page #15

Florida

Student: Sarah Elizabeth Coffey
Research Institution: Stetson University
Display Area: 12, Abstract page #15

Student: Lauren Rose Smiarowski
Research Institution: Florida Atlantic University
Display Area: 13, Abstract page #16

Students: Jessie Somerville and Dinia Salmeron
Research Institution: University of Florida
Display Area: 14, Abstract page #16

Georgia

Student: Kevin Charles Williams III
Research Institution: University of Georgia
Display Area: 15, Abstract page #17

Student: Olivia Lauzon
Research Institution: Kennesaw State University
Display Area: 16, Abstract page #17

Idaho

Student: Abigail Raveling
Research Institution: University of Idaho
Display Area: 18, Abstract page #18

Indiana

Student: Abigail Jacqueline Parker
Research Institution: Indiana University Purdue University Indianapolis
Display Area: 19, Abstract page #18

Iowa

Student: Benjamin T Dralle
Research Institution: Iowa State University
Display Area: 17, Abstract page #19

Kansas

Student: Abdul-Mannaan Giles
Research Institution: Wichita State University
Display Area: 20, Abstract page #19

Kentucky

Student: Lydia Kathryn Biggs
Research Institution: Murray State University
Display Area: 21, Abstract page #20

Louisiana

Student: Cameron Belding
Research Institution: Nicholls State University
Display Area: 22, Abstract page #20

Maine

Students: Andrea L Call and Katharina HC Roese
Research Institution: University of New England
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Maryland

Student: Jesuye T David
Research Institution: Bowie State University
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Massachusetts

Student: Ann Sylvia
Research Institution: Bridgewater State University
Display Area: 23, Abstract page #22

Student: Diego Javier-Jimenez
Research Institution: University of Massachusetts–Dartmouth
Display Area: 24, Abstract page #22

Michigan

Student: Uyen Pham
Research Institution: Grand Valley State University
Display Area: 27, Abstract page #23

Student: Katelan A. Saunders
Research Institution: Michigan State University
Display Area: 28, Abstract page #23

Minnesota

Students: Muna Abdirahman Scekomar and Ashley Tyler Alex
Research Institution: St. Catherine University
Display Area: 29, Abstract page #24

Student: Winonah Ellen Rae Ojanen
Research Institution: The College of St. Scholastica
Display Area: 30, Abstract page #24

Mississippi

Student: Amber Nicole Coats
Research Institution: University of Southern Mississippi
Display Area: 31, Abstract page #25

Missouri

Student: Sarah Gebken
Research Institution: University of Missouri–Columbia
Display Area: 32, Abstract page #25

Montana

Student: William Griffiths
Research Institution: Montana State University Bozeman
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Nebraska

Student: Danielle Tilley
Research Institution: University of Nebraska at Kearney
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New Hampshire

Student: Fiona McEnany
Research Institution: Plymouth State University
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New Jersey

Student: James Laurence Cottrell
Research Institution: The College of New Jersey
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New York

Student: Michael J Deck
Research Institution: Binghamton University
Display Area: 39, Abstract page #28

Student: Natalie Wodniak
Research Institution: Fordham University
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North Carolina

Student: Margaret Maria vanSchaayk
Research Institution: Wake Forest University
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North Dakota

Student: Jordan L Torgunrud
Research Institution: Minot State University
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Ohio

Student: Rebecca Rose Martin
Research Institution: The Ohio State University
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Oklahoma

Student: Connor L West
Research Institution: University of Central Oklahoma
Display Area: 42, Abstract page #30

Oregon

Student: Gregory A Heinonen
Research Institution: Oregon State University
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Pennsylvania

Student: James P Karchner
Research Institution: Temple University
Display Area: 44, Abstract page #31

Student: Justina Toma
Research Institution: Drexel University
Display Area: 45, Abstract page #32

Students: Jeremy Hofer and Abhay Aradhya
Research Institution: Widener University
Display Area: 46, Abstract page #32

Puerto Rico

Students: Miguel Castro-Rivera and Pradyuta Padmanabhan
Research Institution: Inter American University of Puerto Rico–Bayamon
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Rhode Island

Student: Lauren E Salisbury
Research Institution: University of Rhode Island
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South Carolina

Student: Adam J Miller
Research Institution: Clemson University
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South Dakota

Student: Tyler C Seidel
Research Institution: University of South Dakota
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Tennessee

Student: Taylor D Payne
Research Institution: University of Tennessee at Knoxville
Display Area: 51, Abstract page #35

Texas

Student: Alexandria M Weiskircher
Research Institution: Midwestern State University
Display Area: 52, Abstract page #35

Student: Tara L. Clancy
Research Institution: Del Mar College
Display Area: 53, Abstract page #36

Utah

Student: Madelaine Tesori
Research Institution: Weber State University
Display Area: 54, Abstract page #36

Vermont

Student: Joshua A Sassi
Research Institution: Norwich University
Display Area: 55, Abstract page #37

Virginia

Student: Emily A Miller
Research Institution: James Madison University
Display Area: 56, Abstract page #37

Washington

Student: Jasmine Yu Graham
Research Institution: University of Washington
Display Area: 57, Abstract page #38

West Virginia

Student: Morgan Rachelle Menke
Research Institution: West Virginia University
Display Area: 58, Abstract page #38

Wisconsin

Students: Winifred Virginia Redfearn, Simone DeVona Rand, Victoria Jean Kosobucki, Elizabeth Suzanne Larrison, and Deja M Roberson
Research Institution: University of Wisconsin–Platteville
Display Area: 59, Abstract page #39

Student: Kirill Shmilovich
Research Institution: University of Wisconsin–Milwaukee
Display Area: 60, Abstract page #39

Alaska

Student: Jessica Obermiller
Research Institution: University of Alaska Fairbanks
Lead Student Home Institution: University of Alaska Fairbanks
Lead Student Home State: AK
Faculty Advisor: Dr. Sveta Yamin-Pasternak
Division: Social Sciences
Poster Title: The Headscarf Project: Exposing Myself by Covering Up
Display Area: 1

Abstract: This project was research in which I used my own body as an instrument for generating data in a project that bridged ethnographic participant observation with elements of performance art. I am a female of Mexican American and European heritage living in a diversely populated town. I have piercings and tattoos, and I rarely dress conservatively. One day, while wearing a scarf around my head to keep warm at 30 below, I sensed from a set of reactions that some people perceived me as Muslim. I wore a headscarf every day for a year, systematically documenting all detectable verbal and nonverbal acknowledgments toward my appearance (in which no other elements changed). On many occasions I engaged in longer interactions leading to wonderful fantastic conversations I would have not had the chance to engage in otherwise. The project turned into an exploration in the ethnography of perception, showing how the agency of a single signifier (a simple scarf) can be so potent that it obscures all other visible markers (Tattoos, piercings, skin showing, etc), offered simultaneously and likely carrying a different cultural content to the same viewer. Pervading all aspects of this endeavor, the dynamics of perception emerge prominently in spaces between inclusion and otherness, privilege and stigma, authenticity and deceit.

Alabama

Student: Angela R Burke
Research Institution: University of Alabama in Huntsville
Lead Student Home Institution: University of Alabama in Huntsville
Lead Student Home State: AL
Faculty Advisor: Mr. Ryan Wade
Division: Geosciences
Poster Title: Analyzing Tornadic Debris Signatures by Integrating Aerial Imagery and Polarimetric Radar Data in GIS
Funding Agency: NOAA OAR Office of Weather and Air Quality
Grant #: NA16OAR4590210
Display Area: 2

Abstract: The historic April 27th tornado outbreak of 2011 produced 62 tornadoes in Alabama, with the one of the strongest being the EF-5 Hackleburg-Tanner tornado. The UAH Department of Atmospheric Science contracted the Atlantic Group to fly the Hackleburg-Tanner EF-5 tornado track and capture high-resolution swaths of the damage path, as well as the paths for the violent Cullman and Cordova tornadoes. This case study involves detailed analysis of the aerial imagery, including digitizing tree-falls and damage points, and outlining a damage path for the tornado. These analyses are then merged with georeferenced TIFF files (GeoTIFF) of UAH ARMOR (Advanced Radar for Meteorological and Operational Research) polarimetric radar scans of Reflectivity Factor, Radial Velocity, Correlation Coefficient, Differential Reflectivity, and Spectrum width to analyze dual-polarization radar Tornado Debris Signature (TDSs) associated with the Hackleburg-Tanner tornado. An analysis of TDSs from this tornado allows for the characterization of the effects of debris loading as the tornado passed over different types of terrain. Additionally, a large gap in damage from Harvest, AL, to the Tennessee state line is being investigated to determine the possibility that the Hackleburg-Tanner tornado dissipated before Franklin County, TN, and another formed along the same path. The combined analysis of aerial imagery and radar data will provide a detailed picture of how the physical damage and radar signatures correlate and the effects of debris loading over different terrain, which will add confidence to future forecasting of tornadic events.

Arizona

Student: Lindsey Anne Chew
Research Institution: University of Arizona
Lead Student Home Institution: University of Arizona
Lead Student Home State: AZ
Faculty Advisor: Dr. Rajesh Khanna
Division: Health Sciences
Poster Title: A Novel Therapeutic Strategy for Chronic Pain
Funding Agency: National Cancer Institute
Grant #: 1R41CA210857 (awarded to Regulonix, LLC)
Display Area: 3

Abstract: Many "gold-standard" pain medications (such as opioids) provide pain relief at the cost of addiction and other adverse side effects because they target opioid receptors. These drugs function in neurons through semi-indiscriminant inhibition of voltage-gated sodium and calcium channels—which normally open to permit sodium or calcium influx that stimulates the release of pain-associated neuropeptides, small proteins that transmit neuronal information. To overcome this hurdle, we identified the novel therapeutic target collapsin response mediator protein-2 (CRMP2), which traffics ion channels from the interior to neuronal membranes. Only membrane-localized channels can only conduct ions. To this end, we designed small molecules and peptides to interfere with CRMP2's typical points of interaction with ion channels we hypothesized that disruption of this interaction would prevent ion channels' membrane localization, thereby inhibiting the release of pain-associated neuropeptides, and dampening pain signal transmission as well. To test this, we performed live cell imaging experiments on sensory neurons in the pain pathway, and compared ion influx between control and treated-neurons. By labeling neuronal CRMP2 and ion channels, we measured our treatments' capacity to inhibit channels' membrane localization. In numerous rodent models of chronic pain, we then administered our treatments and measured rodents' pain-associated behaviors in addition to addiction-related behaviors. The results demonstrated our strategically-designed small molecules' and peptides' ability to inhibit successfully ion influx, reduce membrane localization, and reverse pain-associated behaviors without addiction-related behaviors in our preclinical studies. Moving forward, this opens the door for significantly more selective, novel, and non-addictive therapeutics for chronic pain.

Arkansas

Students: Brenna Corinne Frandson | Ayushi Saxena
Research Institution: Florida Institute of Technology
Lead Student Home Institution: University of Arkansas
Lead Student Home State: AR
Faculty Advisor: Dr. Munevver Subasi
Division: Biology
Poster Title: Gene Expression and Melanoma Drug Resistivity
Funding Agency: NSF
Grant #: 1359341
Display Area: 4

Abstract: Melanoma, the deadliest form of skin cancer, has extremely poor prognosis once the cancer metastasizes. Thus, a deep understanding is required to improve treatment effectivity. The MAP Kinase pathway is series of proteins that interact, ultimately affecting cell proliferation. In some melanoma cells, the BRAF gene is mutated, which causes this pathway to behave abnormally, and the cells divide at an increased rate. In both cycles, when the MAPK protein is phosphorylated, this cycle is active, and the assumption is made that the cell is dividing. We identified that this protein is phosphorylated in our healthy melanocytes and melanoma cells through western blot analysis. Previous research on this project identified TBC1D16 as a key gene used to cluster 49 cell lines from *The Cancer Cell Line Encyclopedia* which provides mRNA expression and drug response data, among other information on ~1000 cancer patients. We confirmed its presence in our cell lines through western blot analysis. We used gene expression and drug response data for 33 CCLE melanoma cell lines in our research. The two drugs, PD-325901 and AZD-6244, are chosen as they are MEK inhibitors, working on the MAPK pathway. Using support vector machines with recursive feature elimination and correlation based reduction, we identify the top 20 genes important in determining drug response. Many of these genes have been previously linked to melanoma. Using well-known and commonly used classifications techniques on WEKA data mining software, we validated that the top 20 genes can accurately predict response to the two MEK inhibitors.

California

Student: Jessica Rush
Research Institution: Chapman University
Lead Student Home Institution: Chapman University
Lead Student Home State: IL
Faculty Advisors: Dr. Jason Keller | Dr. Cassandra Zalman
Division: Biology
Poster Title: Effects of Temperature on Humic Substance Reduction in a Northern Minnesota Peatland
Funding Agency: Department of Energy, Office of Biological and Environmental Research, Terrestrial Ecosystem Science (TES) Program
Grant #: DE-SC0014416
Display Area: 5

Abstract: Peatlands store one-third of terrestrial soil carbon and play an important role in the global carbon cycle. In addition, peatlands are responsible for a significant fraction of the global flux of the potent greenhouse gas methane, and understanding controls of methane flux from peatlands has important implications for the global climate. Recent work suggests that the microbial reduction of humic substances can suppress methane production and may constrain peatland methane flux in response to ongoing climate change. To determine the direct effects of temperature on humic substance reduction, soil cores were collected from a peatland in northern Minnesota as part of the Spruce and Peatland Responses Under Changing Environments (SPRUCE) project. Soils from 10-20, 75-100 and 175-200 cm depth increments were incubated anaerobically at 5°C or 18°C for 84 days. Humic substance reduction potential (measured as electron shuttling capacity) occurred faster, and suppression of methane ended sooner at warmer temperatures. The potential for indirect effects of temperature (e.g., through changes in soil quality) were explored in the same peatland in plots which had been experimentally warmed to +0, +2.25, +4.5, +6.75 and +9°C (above ambient conditions). There was no impact of ~2 years of experimental warming on humic substance reduction potential measured in soils incubated at a common temperature (18°C) for 42 days. Taken together, this suggests that in the short-term, direct effects of warming will diminish the potential for humic substance reduction to suppress methane production and that this will not be mediated by ecosystem-level changes resulting from warming.

Student: Aditi Newadkar
Research Institution: University of California, Los Angeles
Lead Student Home Institution: University of California, Los Angeles
Lead Student Home State: CA
Faculty Advisor: Dr. Carlos Portera-Cailliau
Division: Biology
Poster Title: Understanding Sensory Processing in Autism Using a Mouse Model of Fragile X Syndrome
Funding Agency: National Institute for Child Health and Human Development (NIH)
Grant #: 5R01HD054453
Display Area: 6

Abstract: Fragile X Syndrome (FXS) is the most commonly inherited form of mental impairment in the United States, affecting 1 in 4000 males, but there is currently no effective treatment for the condition. It is caused by the lack of a protein that is crucial for shaping neural connections, resulting in autistic traits such as delayed learning, challenges in social interaction, and abnormal sensory processing, which is the focus of this project. Abnormal sensory processing results in sensory hypersensitivity, where patients with FXS experience an overload of sensation that often leads to anxiety. My research focused on reversing deficits in visual processing in FXS using a mouse model. We demonstrated that Fragile X mice take longer to learn a visual discrimination task than normal, wild-type mice. Furthermore, Fragile X mice could not perform the task when additional distracting sensory stimuli, such as loud sounds or bright lights, were present, whereas normal mice were unaffected by these distractors. We also simultaneously recorded brain activity in visual brain areas in these animals and discovered that a subtype of inhibitory neurons, the parvalbumin (PV) cells, were much less active in Fragile X mice compared to normal mice. Lastly, using a pharmaco-genetic approach (DREADDs) to over-activate these PV cells in Fragile X mice, we were able to speed up their learning process to a degree comparable to that of the normal mice. Thus, we identified a reversible brain circuit deficit in an experimental model of FXS that holds promise for the treatment of autism.

Student: José Antonio Flores Velazquez
Research Institution: California State Polytechnic University, Pomona
Lead Student Home Institution: California State Polytechnic University, Pomona
Lead Student Home State: CA
Faculty Advisor: Dr. Claude-André Faucher-Giguère
Division: Physics/Astronomy
Poster Title: Star Formation Rate Indicators in the FIRE Galaxy Formation Simulations
Funding Agency: National Science Foundation
Grant #: 1359462
Display Area: 7

Abstract: Understanding the rate at which stars form is vital to understanding galaxy formation. Observationally, the star formation rates (SFRs) of galaxies are typically measured using light in different bands under the assumption of a time-steady SFR. We use galaxy formation simulations from the Feedback In Realistic Environments (FIRE) project, which in some regimes predict time variable (bursty) SFRs, to analyze the timescales probed by H-alpha and far ultraviolet (FUV) SFR indicators. We also quantify the possible dependence of SFR indicators on SFR variability. Our preliminary results based on a Milky Way-mass galaxy simulation indicate that the best-fit timescales probed by these indicators do not depend significantly on whether the SFR is bursty, with best-fitting timescales of about 4 Myr for H-alpha and about 10 Myr for FUV in both the time-steady and bursty regimes.

Colorado

Students: Anna Hessler | David Thomas Radke | Nick Crews
Research Institution: Colorado College
Lead Student Home Institution: Colorado College
Lead Student Home State: CO
Faculty Advisors: Dr. Dan Ellsworth | Dr. Matthew Whitehead
Division: Mathematics/Computer Science
Poster Title: Using Artificial Neural Networks to Predict Wildfire Growth
Display Area: 8

Abstract: Each year, wildfires cause billions of dollars worth of damage to Colorado communities. Currently, fire strategists rely on simple models that rely on elliptical growth patterns to attempt to predict how wildfires grow. The main problem with these models is that they are not very accurate because the features that they predict to affect fire growth become inaccurate after a couple of hours. Our solution incorporates theories and practices from the field of machine learning and artificial neural networks to develop a more accurate fire growth prediction model. We pass satellite imagery such as elevation models, visible and infrared bands, and vegetation classification data into a convolutional neural network that we trained to identify how certain features will affect if the area in question will catch on fire in the next timestep. Then, we combine the output of that network with daily weather data and pass it into another neural network, a multi-layer perceptron model, to train the network to predict how the wildfire will grow in conjunction with variable atmospheric conditions. We hope to produce a model that can serve as a tool for firefighters in their planning process. They will upload classification and weather data for the area of interest, run the model, and receive an image predicting which features will catch on fire next. These more intelligent predictions will allow firefighters in the community of Colorado and elsewhere to target their focus on the areas that will be more likely to impact structures or spread quickly.

Connecticut

Student: Trent Lee Thompson
Research Institution: Sacred Heart University
Lead Student Home Institution: Sacred Heart University
Lead Student Home State: HI
Faculty Advisor: Dr. Khawaja Mamun
Division: Social Sciences
Poster Title: The Impact of a Nation's Research and Development Expenditure on Scientific Literacy
Display Area: 9

Abstract: Through pooled cross-sectional analysis of data from over 60 countries between 1998 and, 2015, controlling for GDP per capita, Internet access, corruption, secondary education, enrollment, and life expectancy rates, we estimate the effects of a nation's research and, development expenditure on scientific literacy. Preliminary results indicate that the, amount of funds a nation allocates towards research and development has a weak, but, positive relationship with scientific literacy. These results suggest that, along with, traditional socio-economic and educational factors, the prioritization of research and, development by a nation—beginning with policymakers—may function as a tacit cultural, approval of science, auspicious to the quality and efficacy of science education.

Student: Tess E Candler
Research Institution: Eastern Connecticut State University
Lead Student Home Institution: Eastern Connecticut State University
Lead Student Home State: CT
Faculty Advisor: Dr. Courtney Broscious
Division: Social Sciences
Poster Title: When Reds Go Green: Determinants of Conservative Support for Environmental Policy
Display Area: 10

Abstract: For the first time in years, Republicans have control of the House, the Senate, and the presidency. Since the start of this united government in early 2017, there have been rollbacks of several major environmental policies. This current trend is consistent with the literature, which finds that conservative ideology is negatively correlated with support for environmental policy. Nonetheless, some of the most significant environmental legislation was passed under Republican leadership, including the creation of the Environmental Protection Agency in the 1970s. This study sought to determine the conditions under which conservatives demonstrate high levels of support for environmental policy. Understanding the rationales of conservative support for environmental policy can help those interested in passing this type of legislation be better equipped to shape policy in a way that increases its likelihood of enactment. A mixed methodology approach was used to create a holistic picture of the role of partisanship in determining environmental support. The quantitative analysis examined the effects of party control, polarization, economic conditions, and public opinion on aggregate congressional support for environmental legislation. The qualitative analysis examined environmental policies that had high levels of support during periods of Republican control in Congress. Results show that party control is the only statistically significant determinant of environmental support in Congress. However, conservatives demonstrate support for environmental policy when there is no States' Rights concern, no unnecessary extension of government, and the policy protects the rights of citizens.

Delaware

Student: Jeremy J Wirick
Research Institution: Wesley College
Lead Student Home Institution: Wesley College
Lead Student Home State: DE
Faculty Advisor: Dr. Malcolm J. D'Souza
Division: Chemistry
Poster Title: Will a Change in the Leaving Group Affect the Rate and/or the Mechanism of ROCOX Solvolytic Reactions?
Funding Agency: NSF S-STEM | NSF EPSCoR | NIH NIGMS INBRE
Grant #: 1355554, IIA-1301765, P20GM103446
Display Area: 11

Abstract: Due to their synthetic utility, there is an increasing interest in ROCOX substrates. In medicinal chemistry, ROCOX compounds are common pharmaceutical reagents in the preparation of peptides, especially as blocking reagents for the protection of free amino or carboxyl groups. For binary solvent mixtures, the two-term Grunwald-Winstein equation is a linear free energy relationship (LFER) between the specific rates of solvolysis of a substrate in a given solvent and the corresponding scales of solvent nucleophilicity (NT) and ionizing power (YCl). Multiple regression analysis provides sensitivities l and m to NT and YCl respectively, and the l and m values serve as useful indicators for the determination of the mechanism of reaction. However, in multi-parameter equations, to avoid multicollinearity, it is important to analyze the solvolyses in solvents of widely ranging nucleophilicity and ionizing power values. In this project, we analyze the experimental data for six ROCOX substrates that have either a chloride or a tosylate as the leaving group. In addition, we analyzed instances when R is an alkyl group or is an aryl substituent. For the six substrates studied, the l/m ratios for similar compounds studied were constant and were independent of the leaving group. Furthermore, for all six ROCOX substrates, the resultant l and m values also signaled the occurrence of a dominant addition-elimination process with a rate-determining addition-step.

Florida

Student: Sarah Elizabeth Coffey
Research Institution: Stetson University
Lead Student Home Institution: Stetson University
Lead Student Home State: VA
Faculty Advisor: Dr. Wendy B Anderson
Division: Geosciences
Poster Title: A Reconstruction of Fire History of the San Juan Islands, Washington
Funding Agency: BLM National Landscape Conservation System Research Support Program (BLM OR-WA District)
Grant #: L14AC00205
Display Area: 12

Abstract: Coast Salish peoples in the San Juan Islands have traditionally used fire in the grasslands as a way of managing native plant communities for agriculture. Natural fire frequency in the islands is among the lowest in Washington, suggesting that historical fire regimes reflect human influence. As Indigenous groups have largely been displaced since the arrival of Neo-Europeans in the archipelago, fire frequency has decreased, which has impacted the productivity of grassland flora. Using macroscopic charcoal as a proxy for fire frequency and radiocarbon analysis to approximate when these fires occurred, I attempted to reconstruct the fire history of San Juan Islands. I took my samples from four sites that were adjacent to the historical grasslands of Iceberg Point, Lopez Island, and Cattle Point, San Juan Island. Peaks in the macroscopic charcoal count signified unique fire events that were used to create mean fire return intervals (MFRIs). The site that was closest to the historical grasslands had the lowest MFRI of 42 years and the site furthest from historical grasslands had the greatest MFRI of 133 years. I also conducted interviews with Coast Salish individuals to glean more knowledge of traditional management techniques through the use of fire. Since there is a general concern about the encroachment of shrubs and invasive species into highly diverse grasslands not only in the San Juan Archipelago but throughout the Pacific Northwest, data on previous management techniques using fire could inform current management solutions.

Student: Lauren Rose Smiarowski
Research Institution: Florida Atlantic University
Lead Student Home Institution: Florida Atlantic University
Lead Student Home State: FL
Faculty Advisor: Dr. Nirmala Prakash
Division: Education
Poster Title: STEAMgineers at Work
Funding Agency: Quantum Foundation
Display Area: 13

Abstract: A pilot program, STEAMgineers at Work, was conducted to engage minority underrepresented adolescents in an interdisciplinary summer enrichment program which emphasized conceptually-linked learning topics such as energy, with a seamless integration into art. An interdisciplinary team from Florida Atlantic University (FAU) Colleges of Medicine and Education in collaboration with science and art senior educators from the Boca Raton Museum of Art (BRMA) and the South Florida Science Center and Aquarium (SFSCA), and the School District of Palm Beach County (SDPBC) designed a curriculum to integrate experiences with art with key components of STEM. Linkage between STEM topics and art promote greater student engagement in core. Students participated in a two-week, out-of-school-time program beginning with daily lessons and activities that focused on learning energy as a global phenomenon, followed by daily trips to BRMA or SFSCA. Participants interacted with exhibits such as Science on a Sphere at SFSCA, allowing them the opportunity to observe relationships between the geosphere and hydrosphere with energy to better understand the impact of temperature change on the Earth's systems. At BRMA students were able to discern the interaction between the Earth's systems by observing landscape paintings and related artwork in addition to artistic activities designed to allow for more in-depth interaction with concepts previously learned. Participants were administered the Science portion of the Iowa Test of Basic Skills (ITBS) at the start of the program and were retested three months later to quantitatively access their basic science understanding and maintenance once the two weeks ended.

Students: Jessie Somerville | Dinia Salmeron
Research Institution: University of Florida
Lead Student Home Institution: University of Florida
Lead Student Home State: FL
Faculty Advisor: Dr. Natalie C Ebner
Division: Psychology
Poster Title: Safety of Chronic Intranasal Oxytocin Administration and Functional Benefits in Aging
Funding Agency: NIH/NIA
Grant #: R24 AG039350, P30 AG028740 & CAM-CTRP, R24 AG039350, PRICE-CTSI-IOA ARG
Display Area: 14

Abstract: With a fast-growing older adult population the importance of finding ways to improve independence and physical, cognitive, and socioemotional well-being has dramatically increased. The neuropeptide oxytocin (OT) has recently received increasing attention as a potential candidate for improving function across these domains. In particular, intranasal OT administration has been shown to reduce pain and inflammation and improve social cognition and affective processing. The majority of current research, however, has examined the acute effects of OT administration and focused exclusively on young adults. The chronic effects of OT and its benefits in older individuals are understudied. To fill this research gap, we conducted a randomized, placebo (P)-controlled, double-blind trial among 51 generally healthy older men (> 55 years), who self-administered 24 international units (IUs) of OT or P twice a day over four weeks. Baseline and identical post-intervention visits comprehensively measured levels of physical (including experimental pain sensitivity and systemic and brain inflammation), cognitive, and socioemotional functioning. Our data showed that OT treatment was well-tolerated in our sample of older men, with no serious adverse side effects. Further, we found evidence of reduced pain sensitivity and increased physical function, directly associated with reduced brain inflammation. These findings provide crucial first support for OT intranasal administration as a safe, practical, and cost-efficient treatment towards enhancing the independence and quality of life in older adults, with little potential for addiction, and thus of tremendous clinical importance.

Georgia

Student: Kevin Charles Williams III
Research Institution: University of Georgia
Lead Student Home Institution: University of Georgia
Lead Student Home State: GA
Faculty Advisor: Dr. Philip V. Holmes
Division: Psychology
Poster Title: The Effects of Galanin on Dopamine in the Mesolimbic System
Display Area: 15

Abstract: There is a high comorbidity between conditions of chronic pain and depression; however, this comorbidity is not well understood. Previous research has indicated that the dysfunction of the mesolimbic system and the dopamine release therein is implied in this comorbidity as dopamine levels play a major role in stress responses associated with conditions such as depression. Galanin, a neuropeptide found in the mesolimbic system pathways has been shown to modulate dopamine release via an inhibitory effect in the ventral tegmental area of the mesolimbic system, thus possibly playing a role in the dysfunction of the dopamine release. This experiment seeks to explore the effects of galanin on dopamine release in the mesolimbic system. To explore these galanin related effects, Sprague Dawley rats were surgically implanted with cannulae. Galanin (n = 4 10ug/ 10ul) or artificial cerebrospinal fluid (n = 4 10ug/ 10ul) as a control was then administered followed by euthanasia within 15 minutes. Brain tissue, especially in the mesolimbic system, was then extracted and analyzed via HPLC (High Performance Liquid Chromatography) to quantify neurotransmitter levels, specifically dopamine, in the mesolimbic system. It is hypothesized that rats that received galanin administration will exhibit lower dopamine levels because of galanin's previously reported inhibitory effect on dopamine release in the ventral tegmental area.

Student: Olivia Lauzon
Research Institution: Kennesaw State University
Lead Student Home Institution: Kennesaw State University
Lead Student Home State: GA
Faculty Advisor: Dr. Ebony Glover
Division: Psychology
Poster Title: Sex Hormone-Related Factors in Emotion Regulation: Implications for Anxiety Disorder Treatment
Display Area: 16

Abstract: Women are two times more likely to be diagnosed with an anxiety disorder than men. However, biological mechanisms underlying sex disparities in anxiety risk are not well understood. Prior research suggests that the reproductive hormone, estrogen, may be an important neuromodulator of emotion in women. More than 17% of women in America use Combined Oral Contraceptives (COC), which contains both estrogen and progesterone. However, few studies have examined effects of COC on anxiety risk. We examined the startle reflex as a measure of emotion regulation among naturally cycling women, women on combined oral contraceptives, and men. We quantified the amplitude of the startle reflex in the presence of a safety cue and a danger cue. Heightened startle in both safety and danger conditions has been previously associated with deficits in emotion regulation. Women were grouped as naturally cycling or COC users. Naturally cycling women were further divided into menstrual cycle phases, follicular (marked by low estrogen), and luteal (marked by high estrogen). We found that women in the follicular phase of their menstrual cycle and women using COCs startled higher in both the danger and safety conditions relative to women in the luteal phase and men. Our findings suggest that women with low estrogen or who use COCs may be at risk for developing an anxiety disorder. Understanding the influence of menstrual cycle phase and estrogen modulators, such as COC, on emotion regulation could lead to better treatment and prevention strategies for anxiety disorders in women.

Idaho

Student Abigail Raveling
Research Institution: University of Idaho
Lead Student Home Institution: University of Idaho
Lead Student Home State: MT
Faculty Advisor: Dr. Nathan Schiele
Division: Engineering
Poster Title: Developing and Evaluating a Mechanical Bioreactor System to Investigate Tendon Mechanics and Mechanobiology
Funding Agency: INBRE Program, National Institute of General Medical Sciences
Grant #: P20 GM103408
Display Area: 18

Abstract: Tendons are strong, collagen-rich tissues that transfer mechanical forces from muscle to bone, playing a vital role in joint motion. Unfortunately, tendons are frequently injured and have poor healing ability. These issues and limited treatment options are major motivating factors for developing tendon replacements using tendon tissue engineering and adult mesenchymal stem cells (MSCs). Mechanical stimulation has the potential to direct MSC behavior, but there is limited information on how these stimuli influence tendon formation. The objective of this project was to design, build, and evaluate a mechanical bioreactor system to apply well-controlled mechanical loading to stem cells in vitro and to evaluate functional properties of developing tendon tissues. We developed a mechanical bioreactor system using 3D modeling software and additively manufactured it on a 3D printer. Custom computer programs were developed that both independently control the motion of three motors and measure the applied forces. To evaluate the system, collagen sponges (e.g., engineered tendon constructs) were seeded with MSCs and cyclically loaded in culture. Static load was used as the control. Initial results indicated that MSCs proliferate in the constructs, and become more aligned and interconnected when mechanically loaded. Using this system, we also showed how the mechanical properties of the engineered tendon constructs compared to normal tendons. Overall, results demonstrate a multifunctional bioreactor system for applying mechanical stimuli to cells in culture and evaluating functional properties. Future studies will use this system for tendon tissue engineering to advance tendon injury repair and healing.

Indiana

Student: Abigail Jacqueline Parker
Research Institution: Indiana University Purdue University Indianapolis
Lead Student Home Institution: Indiana University Purdue University Indianapolis
Lead Student Home State: IN
Faculty Advisor: Dr. Randall J Roper | Dr. Charles R Goodlett
Division: Biology
Poster Title: Developmental and Sex-Specific Differences in Trisomic Dyrk1a Expression in Brain Regions of Ts65Dn Down Syndrome Mice
Funding Agency: National Institutes of Health
Grant #: 1R15HD090603-01
Display Area: 19

Abstract: Down syndrome (DS) results from trisomy of chromosome 21 (Hsa21) in humans and is the most prevalent genetic cause of intellectual disability. DS affects ~1 in 700 live births and is associated with a wide variety of characteristics such as cognitive deficits, bone abnormalities, and heart defects, among other ailments. Variability in life expectancy, developmental age, and cognitive ability has been observed between males and females with DS. Ts65Dn mice are used as a model of DS. They contain three copies of ~50% of the genes that are homologous to those triplicated on Hsa21 in individuals with DS. Overexpression of Dyrk1a, a gene found in three copies in individuals with DS and in Ts65Dn mice, has been linked to DS phenotypes. Little is known about Dyrk1a expression during development in Ts65Dn mice, but due to varying results across different Dyrk1a studies, it is hypothesized that Dyrk1a exhibits differential expression across developmental time points in specific tissue types and between males and females. This study will quantify Dyrk1a protein in the hippocampus, cerebellum, and cerebral cortex at postnatal days 6,12, 15, and 18 to determine whether Dyrk1a exhibits temporal and spatial differential expression across time points and whether there are differences between males and females. This will provide crucial information needed to pursue interventions targeting inhibition of Dyrk1a as a therapy for DS, including the extent to which there may be important differences between males and females that need to be considered in devising such therapies.

Iowa

Student Benjamin T Dralle
Research Institution: Iowa State University
Lead Student Home Institution: Iowa State University
Lead Student Home State: IA
Faculty Advisors: Dr. Lorraine Lanningham-Foster | Ms. Maren Wolff
Division: Health Sciences
Poster Title: Childhood Obesity Treatment in Iowa: Primary Care Providers' and Residents' Practices and Attitudes.
Funding Agency: United States Department of Agriculture - National Institute of Food and Agriculture
Grant #: 2016-67032-25010, project-accession no. 1009096
Display Area: 17

Abstract: Childhood obesity is considered to be one of the greatest public health challenges of this century, especially considering the impact of this disease on the future health and life expectancy of US citizens. Primary care providers (PCPs) have an important role in the assessment and treatment of children with obesity. The development of a healthcare provider's guide for childhood obesity treatment and its distribution throughout Iowa prompted a need to determine further resources to assist PCPs and medical residents in providing obesity treatment. The purpose of this study was to assess Iowa PCPs' and residents' current practices, barriers, and needed improvements for childhood obesity treatment. PCPs and residents in Iowa were invited to complete a survey about childhood obesity-related treatment via email and in-person at educational events. Complete surveys were received from 47 PCPs and 14 residents. Data was analyzed using a modified jackknife process that compared population subgroups to the population at large. PCPs were more likely to always provide general counseling to patients on weight-related behaviors, however when residents counsel patients, they were more likely to use innovative counseling techniques. Compared to PCPs, residents were less likely to provide specific guidance on nutrition or physical activity, and they also had less confidence in counseling about these key behaviors. PCPs were more likely to refer patients to a care coordinator and to community-based services or programs. Residents were more confident than PCPs that Registered Dietitians can help improve patient outcomes for pediatric weight management. Overall, while PCPs in Iowa provide guidance on weight-related behaviors for children, residents appear to be struggling to provide similar guidance in their own practice. These findings suggest areas of focus for further research, educational efforts, and policy development.

Kansas

Student: Abdul-Mannaan Giles
Research Institution: Wichita State University
Lead Student Home Institution: Wichita State University
Lead Student Home State: KS
Faculty Advisor: Dr. Diana Cochran-Black
Division: Health Sciences
Poster Title: Profiling miRNA with Protein Metabolite Expression in Plasma as a Diagnostic and Treatment Biomarker for Early-Stage Alzheimer's Disease.
Display Area: 20

Abstract: Alzheimer's disease (AD) is the most common age-related dementia. Since current fluid diagnostic methods for AD are invasive and expensive, it is important to identify additional molecular signatures outside of cerebrospinal fluid that can characterize early-stage AD. Previous investigations have illustrated abnormal concentrations of proteins and microribonucleic acids (miRNA) in the blood of AD patients. MiRNAs, which are non-coding sequences from DNA have become a target of interest because they can regulate expression of protein metabolites, and are aberrant in plasma of other serious brain disorders such as Parkinson's disease. Considering this, much research is needed to characterize the expression of miRNAs and proteins in plasma as possible markers for AD diagnosis. This study hypothesizes that an abnormal concentration of plasma miRNA and protein metabolites of AD samples will be expressed compared to aged matched controls. It is also likely there is a correlation between aberrant miRNA expression and specific protein metabolite concentrations. To test our hypothesis, we obtained plasma samples from 10 AD patients along with their aged matched controls. Using highly sensitive quantitative techniques such as quantitative reverse transcriptase-polymerase chain reaction (qRT-PCR) we enumerated and identified specific miRNA sequences and proteins. Preliminary data show that total miRNA and protein levels are downregulated and upregulated respectively. Further statistical analysis will examine the dysregulation of both substances to determine any correlations between the two. Our results will provide data and insight to the growing possibility of plasma miRNAs and protein metabolites serving as diagnostic measures for AD.

Kentucky

Student: Lydia Kathryn Biggs
Research Institution: Murray State University
Lead Student Home Institution: Murray State University
Lead Student Home State: KY
Faculty Advisor: Dr. David J Pizzo
Division: Arts & Humanities
Poster Title: Transnational Influences of Early Jesuit Scholars and Explorers in the New World, 1560-1700
Display Area: 21

Abstract: Exploration of foreign territories such as the New World and the Far East by Europeans grew rapidly during the sixteenth and seventeenth centuries. Exploration of these new area lead to developments in understanding of the new places, and the Society of Jesus was one of the forces that facilitated this worldwide social exchange. The purpose of this research is to explore how the Society of Jesus had transnational influences due to its structure and its early explorations and scholarly work done within New France in the 1600s. Most of the information gathered by Jesuit missionaries in New France and other places became resources within Jesuit schools stationed globally as other reference documents. The Jesuit schools began to become filled with reference materials about New France and other foreign missions. These collections accumulated over years, which allowed the Jesuit colleges to become the most advanced in knowledge about foreign lands and colonies that was unprecedented in Europe at that time. Gradually these materials become available for the public as the Jesuits realized that sharing this information they gathered could lead to a large transference of knowledge and possibly increase funding for further expeditions. Information gathered by the Jesuits was critical to monarchies and investors that had put assets into their colonies and businesses in New France because what the Jesuits reported impacted their future business and territorial decisions. The Jesuit investment in journaling and documenting promoted an increase in the transfer of literature and culture across the Atlantic that was unprecedented.

Louisiana

Student: Cameron Belding
Research Institution: Nicholls State University
Lead Student Home Institution: Nicholls State University
Lead Student Home State: LA
Faculty Advisor: Dr. Ramaraj Boopathy
Division: Biology
Poster Title: Presence of Antibiotic-Resistant Enteric Bacteria and Antibiotic Resistance Genes in Recreational Waters of Southeast Louisiana
Display Area: 22

Abstract: In the past few decades, the medical community has faced a rising problem in the spread of antibiotic-resistant bacteria (ARB) and the difficulty of treating related infections. The presence of these bacteria in high-traffic bodies of water, as well as the presence of the antibiotic resistance genes (ARG) floating freely in the water, pose the threat of antibiotic-resistant infections in individuals living and recreating in these areas of southeast Louisiana. Water samples from Cocodrie, LA, and Port Fourchon, LA, were analyzed using chemical, microbial, and molecular methods to determine the presence of ARBs and ARGs. The species analyzed included E. coli, K. pneumoniae, and E. cloacae. They were tested for resistance to carbapenem, monobactam, penicillin, sulfonamide, and cephalosporin antibiotics. Monthly samples were taken in triplicate for a 6-month testing period and tested for water quality standards including salinity, temperature phosphate, nitrate, and ammonia concentration dissolved oxygen, and total and fecal coliforms. Bacteria were isolated, identified using biochemical assays, and tested for antibiotic resistance using Kirby-Bauer assays. DNA isolation, polymerase chain reaction (PCR) and gel electrophoresis were used to identify ARGs. Significant numbers of ARBs were consistently found at both sites, and ARGs were found throughout testing. These numbers, as well as the chemical and coliform data, show that these high-traffic recreational bodies of water may be putting wildlife and humans at risk for antibiotic-resistant infections.

Maine

Students: Andrea L Call | Katharina HC Roese
Research Institution: University of New England
Lead Student Home Institution: University of New England
Lead Student Home State: ME
Faculty Advisor: Dr. Ursula SR Roese | Dr. Kristin M Burkholder
Division: Biology
Poster Title: Antimicrobial Properties of Local Macroalgae against Human Pathogens,
Funding Agency: National Science Foundation, Maine EPSCoR at the University of Maine | National Science Foundation IUSE | National Science Foundation DUE
Grant #: 1355457, 1431955, DUE 1259896
Display Area: 25

Abstract: Marine macroalgae are an underexplored source of bioactive compounds. In addition to ecological functions in macroalgae in their marine environment, these compounds may have antimicrobial properties that have applications against human pathogens. This research focuses on antimicrobial properties of a brown macroalga and two red macroalgae species. All three algae species are found in the rocky intertidal habitat along the Gulf of Maine. Their antimicrobial activity was investigated against an array of WHO priority pathogens. These strains included nine microbes: four gram positive pathogens as well as five gram negative pathogens. Extracts were prepared from all three algae species using solvents of varying polarity, including methanol, dichloromethane, and pentane. Antimicrobial properties of the different extracts were evaluated by measuring the bacterial growth-inhibition-zone around a disk containing algae extracts. Subsequently, a Minimum Inhibitory Concentration (MIC) assay was conducted on the extracts that exhibited the greatest inhibition, to determine the lowest concentration required to inhibit bacterial growth. Of the three solvents, methanolic extracts of two red macroalga species showed the most activity. For the nine pathogens tested, the methanolic extracts showed activity against six: Two gram positive microbes, methicillin-sensitive Staphylococcus aureus strain Newman (MSSA) and methicillin-resistant Staphylococcus aureus (MRSA) strain USA300, as well as four gram negative pathogens: Pseudomonas aeruginosa, Proteus mirabilis, Salmonella typhimurium, and Klebsiella pneumonia. The six microbes that were inhibited by three local macroalgae species are identified as high priority for antibiotic research and development by the WHO. These are very encouraging results, as current antibiotics become less effective.

Maryland

Student: Jesuye T David
Research Institution: Bowie State University
Lead Student Home Institution: Bowie State University
Lead Student Home State: MD
Faculty Advisor: Dr. Josyula Darsana
Division: Mathematics/Computer Science
Poster Title: Comparing the Kasai Weather Prediction Algorithm to Classical Prediction Algorithms
Funding Agency: MAST - ARL
Grant #: W911NF-08-2-0004
Display Area: 26

Abstract: The Kasai algorithm analyzes an input sequence of data and generates a set of rules to make appropriate predictions about given data. Unlike contemporary learning algorithms, Kasai does not just output predicted values based on a learned mathematical model, it also knows when it does not have enough information to make an accurate prediction. In short, Kasai knows when it does not know and therefore is unique. But just how much better is the Kasai compared to other classical algorithms? Over the past few months, we have been working on comparing Kasai to WEKA's classification algorithms, and the results have been fascinating. In one experiment, we analyzed historic weather data in Baltimore, MD, by utilizing four parameters (minimum and maximum values of temperature and dew point) from 1965 and 1966 to predict the same parameters of the daily entries in 1967. We computed the Euclidean distances in four-dimensional space to calculate the differences between actual and predicted values of these results, and then organized them into a set of histograms. We discovered that Kasai outperforms classical algorithms in the prediction task, where mistakes in prediction can be very costly. This is largely attributed to its "I-do-not-know" value that lets users know that more data features are necessary for correct prediction. By comparing the performances of machine learning algorithms, including deep learning algorithms, to that of Kasai on more datasets (like genomic and intrusion detection datasets), we hope to show Kasai's advantages over contemporary machine learning algorithms.

Massachusetts

Student: Ann Sylvia
Research Institution: Bridgewater State University
Lead Student Home Institution: Bridgewater State University
Lead Student Home State: MA
Faculty Advisor: Dr. Jennifer K Mead
Division: Health Sciences
Poster Title: Understanding Patient Experiences with Health-Care Providers and Exercise Promotion
Display Area: 23

Abstract: Obesity-related diseases and disorders are the second leading cause of preventable death. The promotion of exercise from health-care providers has been shown to significantly increase physical activity levels of patients. Prescribing exercise and referring patients to qualified exercise professionals has been identified as an opportunity to reduce the current rate of obesity. The purpose of this study was to describe the information patients receive about regular exercise from primary health-care providers (PHPs). An exploratory descriptive study was conducted in an attempt to understand patient experiences with their healthcare providers regarding exercise promotion. Two dichotomous questions and one open-ended response were used to determine the nature of PHPs' recommendations regarding participation in regular exercise and the qualifications of fitness professionals to support those efforts. The sample consisted of 459 adult females representing three calculated BMI categories. 63.4% of participants indicated their PHPs recommended they engage in regular exercise to support improved health. Through content analysis of open-ended responses of PHPs' exercise recommendations, six distinctive categories representing types of recommended exercise (e.g., endurance training, group exercise) were identified. Of the participants indicating that their PHP's recommendations included engaging in regular exercise, 100% received no information about qualified fitness professionals to guide their exercise efforts. While patients are being encouraged by PHPs to engage in exercise for improved health, the information being offered is limited to the type of exercise to engage in. No information is being provided to help patients identify a qualified exercise professionals to support and guide their exercise efforts.

Student: Diego Javier-Jimenez
Research Institution: University of Massachusetts–Dartmouth
Lead Student Home Institution: University of Massachusetts-Dartmouth
Lead Student Home State: MA
Faculty Advisor: Dr. David R. Manke
Division: Chemistry
Poster Title: Exploring Carbon-Nitrogen Bond Formation Promoted by Early Transition Metals
Funding Agency: National Science Foundation
Grant #: CHE-1429086, CHE-1229339, HRD-1202510 , HRD-1712771
Display Area: 24

Abstract: The Buchwald-Hartwig coupling is an important catalytic process that results in the formation of carbon-nitrogen bonds. This reaction provides a pathway to organic chemicals that cannot be synthesized by other methods. The new compounds that can be produced have a particular importance in the pharmaceutical industry, as this amination process is a critical step in the production of many drug candidates. The coupling is traditionally performed with palladium-based catalysts, and the use of this precious metal adds a significant cost to this reaction. Our lab has discovered a carbon-nitrogen bond coupling reaction that is promoted by an inexpensive early transition metal. We have begun to explore the mechanism and scope of this reaction, working to move from a stoichiometric reaction to a catalytic process. The ability to form carbon-nitrogen bonds with readily available, inexpensive early transition metals could have great impact in the chemistry community and the pharmaceutical industry.

Michigan

Student: Uyen Pham
Research Institution: Grand Valley State University
Lead Student Home Institution: Grand Valley State University
Lead Student Home State: MI
Faculty Advisor: Dr. Rachel A Powers
Division: Chemistry
Poster Title: Structural and Functional Characterization of Fragment-based Inhibitors for OXA-24, an Antibiotic Resistance Enzyme
Funding Agency: National Institutes of Health
Grant #: 2R15AI094489-03A1
Display Area: 27

Abstract: Since their introduction in the 1940's, beta-lactams have been the most prescribed antibiotics due to their effectiveness, low cost, and minimal side effects. Extensive and irresponsible use of antibiotics has contributed to the emergence of several defense mechanisms that bacteria utilize to counteract the activity of beta-lactam antibiotics. The most concerning is the production of beta-lactamase enzymes that catalyze the hydrolysis of the amide bond in the defining four-membered beta-lactam ring, inactivating the antibiotic before it reaches its transpeptidase target in the bacterial cell. One way to suppress the action of beta-lactamase enzymes and overcome resistance is by identifying novel inhibitors that do not share a lactam ring. Previous work in the lab used the computational program DOCK to identify lead fragment molecules. One of these novel molecules (NK3) inhibited OXA-24 beta-lactamase, albeit with weak affinity. Analogs of NK3 were ordered and tested in kinetic assays in an effort to improve binding affinity with OXA-24. Of the analogs tested, a few showed improved binding affinity to OXA-24. To better understand the structural basis for this improved affinity, OXA-24 was crystallized, and atomic-level resolution structures of OXA-24 in complex with the analogs were obtained using X-ray crystallography. With further optimization and improvement, NK3 fragments have the potential to become a new series of class D beta-lactamase inhibitors that are unaffected by current resistance mechanisms.

Student: Katelan A Saunders
Research Institution: Michigan State University
Lead Student Home Institution: Michigan State University
Lead Student Home State: MI
Faculty Advisor: Dr. Amanda Hampton Wray
Division: Psychology
Poster Title: Relationships between Cognitive Proficiencies and Neural Processes Underlying Language in Preschool-Age Children
Funding Agency: NIH/NIDCD
Grant #: R01 DC00559
Display Area: 28

Abstract: Cognitive functions, such as working memory, attention, and intelligence quotient, share many neural networks with language processing. Behavioral assessments are ideal for measuring cognitive functions. However, these measures are often unable to provide information regarding the neural processes underlying these behaviors. Event-related brain potentials (ERPs), electroencephalography (EEG) that is time-locked to specific stimuli, provide a non-invasive measure of neural function with exquisite temporal resolution, making them ideal for measuring specific aspects of neural processing for cognitive functions, such as language. Evaluating the relationships between behavioral assessments and ERPs can enhance understanding of the cognitive functions underlying performance on behavioral assessments. In a previous study, typically-developing 7- and 8-year-old children with higher verbal working memory performance exhibited more mature neural processing for semantics and syntax than children with lower verbal working memory performance children with higher nonverbal IQ performance exhibited faster neural processing for semantics and syntax and children with stronger grammatical skills exhibited faster neural processing for syntax and more mature neural processing for both semantics and syntax. However, these relationships are currently unclear in typically-developing preschool-age children. Using behavioral assessments and ERPs, the current study evaluates relationships between cognitive functions and language processing in preschool-age children. The data indicate that children with greater cognitive proficiencies exhibit more mature neural processes for language, with distinct patterns for different cognitive functions, as seen in previous studies with school-age children and adults. Findings have implications for the understanding of the interactions of cognitive abilities in language development.

Minnesota

Students: Muna Abdirahman Scekomar | Ashley Tyler Alex
Research Institution: St. Catherine University
Lead Student Home Institution: St. Catherine University
Lead Student Home State: MN
Faculty Advisor: Dr. Todd Deutsch
Division: Arts & Humanities
Poster Title: The Impact of the Liberal Arts: Multimedia Student Stories
Display Area: 29

Abstract: While experts and academics advocate for the importance of a liberal arts education, many students pose the question "Is a liberal arts degree worth it?" We examined this question by interviewing four women at various stages in their academic careers to explore the ways that liberal arts education influences students' lives in and outside of the classroom. We present this work as experimental documentary short films that combine animation, photography, and video. Each student's story examines the subtle and complex relationship between the liberal arts classroom environment and their personal growth as humans. Our work focuses specifically on the stories of students with underrepresented narratives navigating the challenging paths of grieving and healing, learning the language of depression, defying the myths of aging, and surviving cancer. Despite their obvious differences, we found common threads in their stories that can be attributed to the influence of an education in a liberal arts setting. In their own ways, each student expressed how the liberal arts provided them with a means to understand and articulate the complexity of their lives and gave them the tools to converse with individuals and communities unlike their own. This experimental approach to filmmaking underscores the effectiveness of interdisciplinary collaboration and reveals the universal in the personal. These films demonstrate how the liberal arts provide an important vehicle for understanding, navigating, and articulating the complexity (and simplicity) of being human.

Student: Winonah Ellen Rae Ojanen
Research Institution: The College of St. Scholastica
Lead Student Home Institution: The College of St. Scholastica
Lead Student Home State: MN
Faculty Advisor: Mr. Troy Abfalter
Division: Physics/Astronomy
Poster Title: Post-Starburst Galaxy Evolution Analysis: E+A Galaxies
Funding Agency: TRIO Ronald E. McNair Postbaccalaureate Achievement Program
Display Area: 30

Abstract: Galaxies are groups of stars held together by gravitational attraction. Galaxies tend to move from younger, highly star-forming galaxies full of young blue stars to older, low star-forming galaxies full of redder, older stars. This research aims to address a rare type of galaxy within galaxy evolution: a post-starburst galaxy called an E+A Galaxy, which makes up 1% of galaxies observed. E+A galaxies experience a sudden high rate of star formation and then sudden "quenching," or stop, of star formation. Through this research, we identify the characteristic properties of an E+A galaxy, and identify them within a new galaxy survey of 2,777 galaxies. We also aim to answer what caused this peculiar type of galaxy: why is it here, and what caused it? How does its properties compare to the other galaxies observed in the universe? Through this research we can learn more about important aspects of galaxy evolution throughout the universe.

Mississippi

Student: Amber Nicole Coats
Research Institution: University of Southern Mississippi
Lead Student Home Institution: University of Southern Mississippi
Lead Student Home State: MS
Faculty Advisor: Dr. Janet R. Donaldson
Division: Biology
Poster Title: Evaluating the Effects that the Cell Membrane Lipid Composition Has on the Resistance to Bile-Induced Damage in Avirulent Strains of *Listeria monocytogenes*
Display Area: 31

Abstract: *Listeria monocytogenes* is a bacterium that causes the very serious food-borne disease listeriosis, which is responsible for about 27.6% of all food-borne deaths. This disease is typically acquired through the ingestion of contaminated food products, so when this bacterium enters the gastrointestinal tract, it is exposed to stressors including bile. Since gastrointestinal bacteria have been shown to incorporate fatty acids from bile into their cell membrane, we started looking at how bile affects the cell membrane. Our lab has shown that Listeria incorporated fatty acids into its cell membrane when exposed to bile, but this incorporation only increased the ability of a non-virulent strain to resist the affects of bile. However, this study was performed using only the non-virulent strain HCC23. To determine if this trend was the same for other non-virulent strains, the fatty acid profiles, survival ability under aerobic and anaerobic conditions, and the membrane rigidity were determined for other strains of Listeria. These results indicated that each of the non-virulent strains incorporated Stearic and Oleic acid into their membrane and increased the amount of Palmitic acid, which helped these strains to survive better when exposed to bile. This study showed that non-virulent strains may incorporate fatty acids to survive bile, but that this may come at the expense of a loss in fitness in other stressors. Further research is needed to determine if this mechanism of bile survival impacts the expression of efflux pumps involved in the resistance to stressors.

Missouri

Student: Sarah Gebken
Research Institution: University of Missouri–Columbia
Lead Student Home Institution: University of Missouri–Columbia
Lead Student Home State: MO
Faculty Advisor(s): Dr. J. Chris Pires
Division: Engineering
Poster Title: Preparing a Genetic Engineering Technique to Bring into the Brassica Crop Plants to Further Understand Why Kale and Broccoli Are Phenotypically Different
Funding Agency: National Science Foundation, McNair Scholar
Grant #: 1339156
Display Area: 32

Abstract: CRISPR/Cas9 is a genetic engineering tool that is revolutionizing the field of biology. CRISPR stands for Clustered Regularly Interspaced Palindromic Repeats and is a system that can be used to promote quick, targeted, and inexpensive modifications in many organisms. In this project, we are using this technology to modify physical features in plants to gain a better understanding of how these changes will affect the growth of the plant's leaves, stems, and flowers. Our project will increase our understanding of the CRISPR/Cas 9 system by allowing us to test various guide RNA (gRNA) designs, which work like a GPS to guide the system to the targeted area on the genetic code. The results of this project hope to determine what method of gRNA works best for targeting specific genes related to phenotypic differences related Brassica oleracea which includes plants such as kohlrabi, broccoli, and kale. We are using Arabidopsis as a model for these Brassica crops because they are closely related and Arabidopsis is much faster, cheaper, and easier to work with. Successfully completing this project will help to lay the groundwork to use this technology with more difficult plants to transform such as the Brassica crops. If we can utilize this method with these crop plants, there is a possibility of making a better crop that helps farmers and consumers nationwide.

Montana

Student: William Griffiths
Research Institution: Montana State University Bozeman
Lead Student Home Institution: Montana State University Bozeman
Lead Student Home State: MT
Faculty Advisor: Dr. Mark Fiege
Division: Arts & Humanities
Poster Title: Our Last Cast: The Future of Fly Fishing in the American West
Funding Agency: Montana State University
Display Area: 33

Abstract: Fly fishing for salmonid species is iconic in the American West. Anglers have been on the forefront of conservation efforts and stewards to this nations rivers and streams for over 100 years. But, we face a new challenge, the age of the Anthropocene. Dramatic losses of cold water habitat are predicted to occur in the twenty-first century, impacting human and salmonid communities across the American West. The far-reaching consequence of human caused climate change is already having negative impacts on coldwater fisheries in the West. My research focuses on the need for anglers to better understand current and future environmental changes and the subsequent consequences for freshwater fisheries. The culmination of my project – a short book – communicates the urgency of the impacts we face in a way that is accessible to guides, outfitters and anglers. The book will explain the future effects of climate change on the social, economic, and ecological aspects of fly fishing communities on the Deschutes, Yellowstone and Madison, and Salmon Rivers within their corresponding states: Oregon, Montana, and Idaho. There is a pressing need to convey these concepts so we can prepare and react more effectively to the current environmental crisis. My time spent interviewing climate scientists, land resource managers, biologists, outfitters, guides, and many others along with an extensive literature review has led to a depth of interdisciplinary knowledge. Since September of 2016 I have drafted two out of three chapters and have received funding to complete the third this academic year.

Nebraska

Student: Danielle Tilley
Research Institution: University of Nebraska at Kearney
Lead Student Home Institution: University of Nebraska at Kearney
Lead Student Home State: NE
Faculty Advisor: Dr. Megan M Adkins
Division: Education
Poster Title: The Evaluation of Home School Physical Education Participant Perceived Versus Actual Level of Physical Activity.
Display Area: 36

Abstract: Children's perceptions of physical activity (PA) levels can vary, with many children believing they worked harder or lighter than reality. Accuracy (discrepancy between perceived and actual) of perceived PA exertion levels are important contributors to the three domain-specific components and motivational processes in Physical Education (PE). The purpose of this study is to examine simultaneously, the interrelationship among age and accuracy of perceived physical activity levels of elementary-aged children. Children (N= 57), ages 8-15 years, were given an explanation of the three different PA levels, and practiced activities related to each PA level to help them understand the different categories and how their bodies should feel after completing activities at each level. The children then completed PE classes for eight weeks. During the time, children completed self reports of perceived PA level categorized as low, medium, and high by placing a magnetic Plicker on a board that the teacher scanned after class to retrieve the data. The students wore an Interactive Health Technology heart rate monitor which correlates heart rate data and creates activity cut points through the manufacturer software to categorize the heart rate levels into PA levels of low, moderate, and vigorous. The results of the actual effort (IHT monitors) and the students' perceived effort (Plickers) will be compared in order to determine the accuracy of the children's perceptions. The results of this study will provide PE educators with information regarding students' age and the accuracy of their perceptions toward the workout.

New Hampshire

Student: Fiona McEnany
Research Institution: Plymouth State University
Lead Student Home Institution: Plymouth State University
Lead Student Home State: NH
Faculty Advisor: Dr. Heather E Doherty
Division: Biology
Poster Title: Connective Tissue Growth Factor Gene Variants Are Correlated to Family History of Heart Disease
Funding Agency: National Institutes of Health
Grant #: P20GM103506
Display Area: 37

Abstract: In the United States, more than 6 million people are living with heart failure. Current therapies focus on support but cannot stop or reverse progression leaving significant room for improved treatment. Cardiac scarring following a heart attack is a primary cause of heart failure. The degree of scarring between individuals is variable, in part due to genetic differences. Thus, heart failure cannot be effectively addressed without understanding genetic risk. Following a heart attack, cells are activated that initiate wound healing, although over-activation can lead to cardiac scarring. Overexpression of the Connective Tissue Growth Factor (CTGF) gene is central to cell activation, and genetic variants that upregulate CTGF are correlated with increased organ scarring. However, the effect of variants that may alter CTGF function in other ways remains unknown. Exploration of genetic variants in 172 people identified 11 known variants and, surprisingly, 6 unknown changes. Information on family history of heart disease was also collected from participants. Three variants correlated with an increased family history of heart attack or high blood pressure. A fourth variant appears to be protective against heart diseases. Our current sample population is small and mainly Caucasian, limiting our conclusions. Future directions include (1) sample a larger, more diverse population to validate our findings and (2) test in a laboratory model if any genetic variants can alter scarring. Results of our studies will assist clinicians in identifying individuals with genetic susceptibility to scarring and allow targeting of therapies to patients at greater risk.

New Jersey

Student: James Laurence Cottrell
Research Institution: The College of New Jersey
Lead Student Home Institution: The College of New Jersey
Lead Student Home State: NJ
Faculty Advisor: Ms. Susanna Monseau
Division: Social Sciences
Poster Title: Automation: The Risk to Jobs and the Future of Work
Display Area: 38

Abstract: Jobs have been both created and displaced by technological advancement. With the accelerated advancement of technology in the twenty-first century, individuals must be prepared for changes to the workplace. Currently, job automation at the hands of technology allows employers to hire fewer workers and cut labor costs. Some experts predict that up to 47% of US jobs are at risk from automation over the next 20 years, and low wage work is particularly susceptible. Even some skilled work is vulnerable to displacement by technology. Certainly, there are beneficiaries from these advancements, such as business owners and consumers. However, the workforce may suffer with this rapid advancement of technology and its incorporation into the workplace. How will workers plan for larger changes or even the potential elimination of their work? This research analyzes current capabilities of automation in the workplace, particularly within the financial and business services industry. I look to assess estimates of the percentage probability of automation in specific occupations and compare them to future employment outlooks and statistics generated by the Bureau of Labor Statistics. By comparing the relationship between speculation, statistical projections, and types of work activities, inconsistencies are examined to gain a better context of the future of employment. Finally, policy solutions to the changing workplace and potentially lower employment levels are evaluated. The interests of individuals, employers, and the government are carefully weighed to provide a fair and practical policy recommendation focusing on reeducation, job retraining, and universal basic income.

New York

Student: Michael J Deck
Research Institution: Binghamton University
Lead Student Home Institution: Binghamton University
Lead Student Home State: NY
Faculty Advisor: Dr. Fengxia Xin
Division: Chemistry
Poster Title: Synthesis and Optimization of Cu-Sn Nanoparticles to Be Used in Lithium-Ion Batteries
Funding Agency: U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Program
Grant #: DE-EE0006852
Display Area: 39

Abstract: The lithium-ion battery has quickly grown into a multibillion dollar industry. They are now the primary method of energy storage for consumer electronics and electric vehicles, in addition to complementing renewable energy resources such as solar panels and wind turbines. As the global conversion to clean energy rapidly rises, growth of the industry is projected to follow. Since lithium-ion battery applications are exponentially increasing, new materials with high energy density must be synthesized. Tin is of main scientific interest due to its theoretical energy storage capacity being almost three times greater than that of graphite, the current commercially used anode material in lithium-ion batteries. However, volumetric changes during the lithium insertion/extraction process hinder its practical charge-discharge life. This is due to the active material losing physical contact with the current collector that the stored energy flows through. In this research, we synthesize copper-tin nanoparticles to be used as an anode in lithium-ion batteries as an alternative to graphite. This specific alloy is advantageous because it improves electrochemical performance by buffering volumetric fluctuations and having good electronic conductivity. We have successfully developed this unique alloy and demonstrated that the behavior of the energy storage capacity with respect to volume is 1.5 times greater than graphite. The results confirm that the adoption of Cu-Sn nanoparticles has not only a high energy storage capacity but also enhances the cyclability of electrochemical reactions. Moreover, they provide key insights to design of the next-generation lithium-ion anode for high performance lithium-ion batteries.

Student: Natalie Wodniak
Research Institution: Fordham University
Lead Student Home Institution: Fordham University
Lead Student Home State: IA
Faculty Advisor: Dr. Rachel A Annunziato
Division: Social Sciences
Poster Title: Medical Experiences of Refugees from Burma: The Karen Ethnicity Perspective
Display Area: 40

Abstract: The nation of Burma (now Myanmar) has endured a civil war for over 60 years. The Karen ethnic group, located in southeastern Burma, is one of the many minority groups that has been forced to flee the nation. This study examined the medical experiences of Karen refugees who have been resettled to the United States. During a two- month period, structured interviews were conducted with 39 refugees in 3 U.S. cities (Fort Wayne, IN; Amarillo, TX; and Buffalo, NY), where large populations of Karen refugees have settled. The interviews, which were recorded and transcribed, included questions about their usage of traditional medicine both in Burma and in the United States, their satisfaction with Western medicine, and their experiences in the American health-care system. Nearly all of the refugees primarily used traditional medicine in Burma, but of the 39 refugees interviewed, only 6 felt able to continue to use using traditional methods in the United States While most of the interviewees trusted Western medicine and had positive experiences with American doctors and hospitals, 15 of the refugees expressed dissatisfaction and distress with obtaining health insurance and confusion over its coverage. This study brings to attention the need to improve refugee healthcare, both by encouraging traditional practices and assisting refugees with insurance coverage. In addition, broadly, findings indicate that refuges do not feel that traditional practices are accepted in the U.S. that may have implications on health-care utilization and ultimately well-being. Further research is needed to examine these relationships.

North Carolina

Student: Margaret Maria vanSchaayk
Research Institution: Wake Forest University
Lead Student Home Institution: Wake Forest University
Lead Student Home State: NC
Faculty Advisors: Dr. Sang Jin Lee | Dr. Ji Hyun Kim
Division: Health Sciences
Poster Title: Effects of Bioactive Molecules on Skeletal Muscle Development in 3D Bioprinted Muscle Constructs
Funding Agency: Department of Defense Armed Forced Institute of Regenerative Medicine (AFIRM) | National Institutes of Health Biomedical Technology Resource Center P41 - Center for Engineering Complex Tissues
Grant #: P41EB023833
Display Area: 34

Abstract: Patients with volumetric muscle loss (VML), an injury often sustained from combat-related injuries, experience profound structural and functional impairment. The current standard of care, autologous muscle graft, is often limited by unavailability of suitable host tissue and poor grafting efficacy which prevents functional restoration of muscle mass. Bioengineered functional skeletal muscle has potential to fill this clinical void. To engineer skeletal muscle tissue, several biofabrication techniques have been previously applied. However, these techniques have faced inadequate fiber alignment for functionality with clinically-relevant size for treating VML. To overcome this limitation, we fabricated skeletal muscle constructs using 3D bioprinting of human muscle progenitor cells (hMPCs). The constructs showed a high degree of muscle fiber alignment. To achieve functional recovery in vivo, further development of the constructs is needed. In this study, we investigate the effects of bioactive molecules on muscle development. The conditioned medium factors from the human neural stem cell (hNSCs) were tested in 2D hMPC culture and 3D bioprinted muscle constructs. Muscle development was evaluated after 5 days of differentiation by immunostaining with myosin heavy chain (MHC). Our results demonstrated that the treatment of Fibroblast Growth Factor-2 (FGF-2) and Hepatocyte Growth Factor (HGF) significantly increased the development of skeletal muscle. In the future, studying the synergistic effects of these factors with other factors may produce an even more pronounced effect on muscle development. This finding may be beneficial in working toward improving development of bioprinted muscle constructs that may contribute to functional restoration in VML injury in vivo.

North Dakota

Student: Jordan L Torgunrud
Research Institution: Minot State University
Lead Student Home Institution: Minot State University
Lead Student Home State: ND
Faculty Advisor: Dr. Mikhail M Bobylev
Division: Chemistry
Poster Title: Scalable Synthesis of Novel Cancer-Preventing Agents
Funding Agency: North Dakota Established Program to Stimulate Competitive Research | North Dakota IDeA Network of Biomedical Research Excellence
Grant #: 8 P20 GM103442-12
Display Area: 35

Abstract: Substituted benzylmorpholines were identified as selective inhibitors of lung cytochrome P450 2A13 for chemoprevention of lung cancer in tobacco users. 4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) is one of the most prevalent and procarcinogenic compounds in tobacco., It is bioactivated by respiratory cytochrome P450 (CYP) 2A13, forming DNA adducts and initiating lung cancer. CYP2A13 inhibition offers a novel strategy for chemoprevention of tobacco-associated lung cancer., , Considering the potential use of substituted benzylmorpholines as medicines, we decided to investigate if the Leuckart reaction can provide a better alternative to the existing methods for their synthesis. Last year we reported a successful synthesis of a model substituted benzylmorpholine via the Leuckart reaction with the isolated yield of 82%. The new green procedure did not use any toxic or expensive reagents or solvents, did not need any catalysts, and produced no waste. The presented work was based on the hypothesis that the extraction and column chromatography steps were mostly responsible for the losses of the product. The work had an ultimate goal of the total elimination of these isolation procedures. If successful, the investigation could increase the isolated yield of the product, simplify the synthesis and make it more suitable for a future scale-up and manufacturing. The investigation resulted in a successful replacement of the extraction and column chromatography steps with a newly developed selective precipitation procedure. The isolated yield of a model substituted benzylmorpholine reached 99.7%. This work provides a new simple, scalable and environmentally friendly method for the synthesis of novel cancer-preventing agents.

Ohio

Student: Rebecca Rose Martin
Research Institution: The Ohio State University
Lead Student Home Institution: The Ohio State University
Lead Student Home State: OH
Faculty Advisor: Dr. Carmen Taleghani-Nikazm
Division: Social Sciences
Poster Title: Surveying Berlin Residents' Attitudes and Perspectives about Refugee Asylum
Display Area: 41

Abstract: Since the summer of 2015, Europe has struggled to deal with the influx of refugees and migrants from Syria, Iraq, and other Middle Eastern and North African nations. Germany's Chancellor, Angela Merkel, declared an "open-door" asylum policy that would accept all migrants seeking asylum and in 2015 Germany accepted over 1.1 million immigrants. The reactions of German citizens and politicians varied widely. As the influx of migrants continued, discourse changed noticeably in German news sources and political rhetoric. This research used a survey and aimed to better understand the opinions of Berlin residents about refugees and migrants in Berlin. This survey was active from May-July 13, 2016. It obtained Berlin residents' opinions and background information of the participants (104 total responses). It was hypothesized that Berliners who perceive their economic situation to be worsening would be less likely to support the asylum policy. The results demonstrated a link between self-described economic outlook and perception of refugees. This correlation was statistically significant based on a Chi-squared test ($X2=23.1$, $df=4$, p-value< 0.05). These findings are topical in the current political climate of the Global North, and parallels can be made to the U.S. due to the present suspension of the refugee program. The outcome of this project sheds light on the personal perspectives of Berliners' on the asylum policy, those perspectives connection to xenophobia in a German context, and the rise of right-wing extremism. This information can be useful in better informing public bodies about refugees and provide insight into immigrant integration.

Oklahoma

Student: Connor L West
Research Institution: University of Central Oklahoma
Lead Student Home Institution: University of Central Oklahoma
Lead Student Home State: OK
Faculty Advisor: Dr. Wei R. Chen
Division: Engineering
Poster Title: Immunological and Thermal Properties of Gold Nanorods in Laser Immunotherapy for Cancer Treatment
Funding Agency: National Institutes of Health
Grant #: 1 R21 EB015509-01A1
Display Area: 42

Abstract: Laser immunotherapy (LIT) is a novel cancer treatment method specifically developed for late-stage metastatic cancers. LIT combines near-infrared (NIR) laser irradiation and immunological stimulation to induce a systemic anti-tumor immune response. To increase thermal efficacy of laser irradiation, light-absorbing nanomaterials have been used in LIT. These nanomaterials can also deliver immune-stimulating biomolecules to target tissue. Single-walled carbon nanotubes (SWNTs) have been used in LIT for treatment of metastatic tumors in animal studies. While effective, the toxicity of SWNTs has been a constant concern for future clinical applications. We attempted to use gold nanorods (AuNRs), which have been used in clinical studies, to replace SWNTs in LIT. We selected AuNRs with a strong absorption peak at 1064 nm, ideal for deep-tissue penetration by laser light. In our in vitro studies, we determined that the thermal properties of SWNTs and AuNRs are very similar. Conjugation of immunological stimulant to SWNTs and AuNRs has increased CD80 release from dendritic cells, indicating the immunological stimulation capability of the nanomaterials modified by appropriate immunoadjuvant. Furthermore, in our in vitro studies with the highly metastatic murine breast cancer cell line 4T1, using AuNRs has increased cell death and decreased cell motility following laser irradiation. Based on these results, further applications of AuNRs in LIT will be explored, including treatment of metastatic tumors in mice. Our research could lead to a potential treatment modality for late-stage, metastatic cancers, which have been the major cause of cancer-related death in health-care.

Oregon

Student: Gregory A Heinonen
Research Institution: Oregon State University
Lead Student Home Institution: Oregon State University
Lead Student Home State: OR
Faculty Advisors: Dr. Megan MacDonald | Ms. Sophie P Pierszalowski
Division: Social Sciences
Poster Title: Examining the Relationship between Parent and Child Health in Young Children with Developmental Disability
Funding Agency: National Institutes of Health
Grant #: R01 HD059838
Display Area: 43

Abstract: Over the past two decades, childhood obesity has become an epidemic. Children of overweight or obese parents are up to 40% more likely to be overweight or obese while the age of onset of obesity is a strong predictor of later risk factors including increased morbidity and mortality. Further, children with disabilities are at a higher risk of being overweight or obese. The purpose of this study was to examine factors related to childhood obesity in young children with developmental delay (DD). The sample was comprised of 113 preschool-aged children (M = 45 months SD = 10 months) and their parents. This study used family demographic characteristics and ratings of weight status coded using videotaped parent-child play., , Pearson correlations were conducted to determine initial relations between child and parental weight status, as well as other known contributors to this variable including income, age, and gender. Linear regression analysis was conducted with child weight as the outcome variable. The independent variables in the regression included parent weight status, family income and child age. After controlling for these important variables, parental weight ($p = 0.002$) and household income ($p = 0.03$) were significantly associated with child weight. Findings from this study indicate parent/caregiver weight status has a significant relationship with child weight status in young preschool aged children with DD. Intervening early with parents and caregivers of young children with DD is a likely initial step to help prevent the continuing exacerbation of these inequities.

Pennsylvania

Student: James P Karchner
Research Institution: Temple University
Lead Student Home Institution: Temple University
Lead Student Home State: PA
Faculty Advisor: Dr. Nancy Pleshko
Division: Engineering
Poster Title: Non-Destructive Spectroscopic Assessment of Articular Cartilage Composition and Mechanical Properties
Funding Agency: National Institutes of Health
Grant #: NIH NIAMS RO1 AR056145
Display Area: 44

Abstract: Osteoarthritis (OA) of the knee results in more than 600,000 total joint replacements annually in the United States, and is projected to reach 3 million by 2030. OA disproportionately affects our aging and veteran population, with 20% of civilians and 25.4% of veterans affected. OA is also the second leading cause of discharges in the US Army. Articular cartilage defects are precursors to OA, and current clinical interventions involve utilizing grafts from regions of the patient's intact cartilage to repair those defects. However, the properties of cartilage, including both mechanical and compositional, vary regionally, and a method to effectively select grafts that match the properties of the native cartilage surrounding the defect has not been optimized. Infrared fiber-optic (IFOP) spectroscopy is a powerful tool that permits non-destructive analysis of tissue composition. We investigated whether IFOP spectral data would correlate with cartilage biochemical and mechanical (functional) properties, and thus have the potential to be used as an inter-operative tool for graft selection. As a model for human tissues, plugs were obtained from several regions of bovine cartilage, evaluated spectroscopically, mechanically tested for stiffness (modulus), and biochemically evaluated for the primary components of cartilage, collagen, proteoglycan (PG), and water. Spectroscopic data were found to correlate with cartilage moduli, and with water and PG content, supporting the use of this technique for non-destructive assessment of native articular cartilage. Such evaluation could lead to superior graft selection during surgical intervention, allowing improved integration and longer lasting repairs, delaying the onset of OA.

Student: Justina Toma
Research Institution: Drexel University
Lead Student Home Institution: Drexel University
Lead Student Home State: PA
Faculty Advisor: Dr. Jessica R Barson
Division: Biology
Poster Title: Inhibition of Neuronal Activity in the Paraventricular Thalamus to Affect Ethanol Intake
Funding Agency: National Institute on Alcohol Abuse and Alcoholism
Grant #: 5R00AA021782-05
Display Area: 45

Abstract: The paraventricular nucleus of the thalamus (PVT) is a region of the brain that is essential in integrating information about an individual's current state, including their emotions, level of hunger, pain, and their level of arousal. Recently, the PVT has also been shown to be important in alcohol intake, with stimulation of its two major subregions (anterior vs. posterior) leading to opposite changes in alcohol drinking. It is currently unknown how alcohol intake is affected by inhibition of the anterior and posterior PVT subregions. This study used the technique, Designer Receptors Exclusively Activated by Designer Drugs (DREADDs), to target the neurons in each PVT subregion so that they could be turned off following injection of the drug, clozapine-N-oxide (CNO). We first trained male rats to press a lever for an alcohol reward in an operant chamber. Once their day-to-day responding was stable, we injected them with CNO and found that inhibition of the posterior PVT increased rats' lever pressing for alcohol, with this effect being greater following a higher dose of CNO. In contrast, inhibition of the anterior PVT did not significantly affect rats' lever pressing. These results suggest that the neurons in the posterior PVT may be more important than those in the anterior PVT in alcohol intake and, further, that these posterior PVT neurons normally function to suppress alcohol intake. This novel information suggests that neurochemicals made by these posterior PVT neurons could be targeted for the development of new drugs for the treatment of alcohol use disorders.

Students: Jeremy Hofer | Abhay Aradhya
Research Institution: Widener University
Lead Student Home Institution: Widener University
Lead Student Home State: PA
Faculty Advisor: Dr. Suk-Chung Yoon
Division: Mathematics/Computer Science
Poster Title: Computer-Assisted Discovery of Small-Molecule Cancer Immunotherapeutics
Display Area: 46

Abstract: Cancer is the second leading cause of death in the US, accounting for nearly 1 in every 4 deaths annually. In 2016 it was estimated that 1,685,210 new cancer cases would be diagnosed with approximately 595,690 individuals dying from the disease. Current cancer treatments are limited to surgery, radiation, and toxic chemotherapeutic drugs, all of which have serious and often long term and permanent side-effects. Therefore, the current project aims to discover novel compounds with potential to be developed into selective, non-genotoxic cancer immunotherapy drugs as opposed to the current toxic chemotherapeutics and invasive treatments available. To achieve this goal, a target protein that has been proven to inhibit cancer cell growth upon its activation was selected for comprehensive computational simulation and analysis. Based on the simulations performed, an ideal pocket site with potential to bind drug-like molecules has been identified on this protein. A large database of commercially-available compounds is then screened against this binding pocket to determine which compounds have a high probability of binding to the protein. Based on these computational screening results, approximately 50 compounds are selected for an experimental study to investigate their immunotherapeutic effects in various biophysical and cell-based assays. The active compounds may form the basis for development of novel, selective small-molecule therapeutics against several types of cancer.

Puerto Rico

Student: Miguel Castro-Rivera | Pradyuta Padmanabhan
Research Institution: Inter American University of Puerto Rico - Bayamon
Lead Student Home Institution: Inter American University of Puerto Rico - Bayamon
Lead Student Home State: PR
Faculty Advisor: Dr. Padmanabhan Seshaiyer | Carmen Caiseda
Division: Mathematics/Computer Science
Poster Title: Mathematical Modeling, Analysis, and Simulation of the Spread of Gangs in the Youth Population of Puerto Rico
Funding Agency: National Science Foundation
Grant #: 1407087
Display Area: 47

Abstract: Crime fighting and gang activity are controversial social issues that affect youth. To prevent and minimize gang spread in the youth of Puerto Rico a new mathematical model was developed. Gang membership is treated as an infection, using the SIR model to develop the governing differential equations. This new model accounts for the possibility of determining how members of the youth community interact with the infected adult (gang members) community using three different mixing patterns: proportionate, preferred and like-with-like mixing (Brauer and Castillo Chavez 2012). We also derived a new mathematical result that helps to predict the dynamics of the spread of gangs. The numerical results of the implementation of the three mixing patters are presented along with conclusions.

Rhode Island

Student: Lauren E Salisbury
Research Institution: University of Rhode Island
Lead Student Home Institution: University of Rhode Island
Lead Student Home State: RI
Faculty Advisor: Dr. Jose A. Amador
Division: Biology
Poster Title: Community Structure and Succesional Patterns of Benthic Infauna of Rhode Island Oyster Farms
Funding Agency: Rhode Island Sea Grant/NOAA | National Science Foundation EPSCoR
Grant #: EPS-1004057
Display Area: 48

Abstract: Over the past 20 years, oyster (*Crassostrea virginica*) aquaculture has become increasingly popular in the coastal lagoons of southern New England. Although it is understood that oysters help to provide beneficial ecosystem services, little research has been conducted on the impacts of oyster biodeposits and soil disturbances on the benthic environment. We assessed the impacts of oyster aquaculture on the trophic structure and diversity of benthic infauna, by investigating indicator species and patterns suggestive of benthic community succession. Infauna were collected from aquaculture and control sites in Potter, Ninigret, and Winnapaug Ponds, identified to species level, and subsequently sorted by functional feeding group. There were 64 species and seven functional feeding groups present across all sites. Samples were analyzed for species diversity, site similarity, and species dominance using PRIMER 7. Aquaculture sites had a higher total abundance, and higher numbers of deposit feeders and interface feeders, than control sites. There was no significant difference in species diversity between aquaculture and control sites. Species composition was most similar among aquaculture sites within the same pond, and least similar between aquaculture and control sites of the same pond. Our results suggest oyster aquaculture alters trophic community structure of infauna and may accelerate the pace of succession by creating environmental conditions that support recruitment of opportunistic organisms sooner, and in greater numbers, than control sites. Our results provide baseline data useful to benthic ecologists, land-use managers, and aquaculture farmers in southern New England.

South Carolina

Student: Adam J Miller
Research Institution: Clemson University
Lead Student Home Institution: Clemson University
Lead Student Home State: SC
Faculty Advisor: Dr. Chad E Sosolik
Division: Physics/Astronomy
Poster Title: Vacuum Applications of 3D Printed Materials and Devices for Ion Beam Physics
Funding Agency: National Science Foundation
Grant #: 1560070
Display Area: 49

Abstract: We have investigated the properties of 3D printed materials and devices under high vacuum conditions and in contact with ion beams. In recent years additive manufacturing and 3D printing have exploded into a multi-billion dollar industry for hobbyists, researchers, and prototype designers. While this development has changed many approaches to modern innovation and become a popular tool for the scientific community, the properties of such materials under extreme working conditions is poorly understood. In our laboratory we have focused on the integrity of 3D materials under vacuum conditions and their ability, when incorporated into devices, to manipulate and control ion beams in vacuum. Specifically, we have measured the out-gassing and mass loss of printed materials exposed to vacuum conditions. In addition, using a combination of conductive and non-conductive layers, we have assembled and tested deflector-type devices that can manipulate ion trajectories. While NASA maintains a large database on material properties under vacuum, very little of that data applies to 3D printed materials. Therefore, our results are both new and useful to the spaceflight community. Also, by developing tested applications for 3D printed devices that function in vacuum, such as our ion deflector, we show that one can significantly reduce both prototyping times and setup costs for new vacuum-based technologies.

South Dakota

Student: Tyler C Seidel
Research Institution: University of South Dakota
Lead Student Home Institution: University of South Dakota
Lead Student Home State: SD
Faculty Advisor: Dr. Jeff Wesner
Division: Biology
Poster Title: Effects of Fishes on Aquatic Insects in Linked Aquatic Terrestrial Food Webs
Funding Agency: National Science Foundation
Display Area: 50

Abstract: Aquatic insects are an important source of energy for freshwater fishes and an important source of energy in linked aquatic-terrestrial food webs. However, the consumption of aquatic insects by fishes may reduce the energy available to aquatic and terrestrial food webs. Our research predicted that fishes would alter local food webs and affect ecosystem productivity. Emergence traps and fish exclusion cages were used to collect emerged aquatic insects from treatments with and without fish to determine the reduction of insect emergence by fishes to terrestrial ecosystems. Furthermore, fish and benthic communities were sampled and recorded, fish diets were sampled, and terrestrial insectivorous spider abundances were recorded. Research took place above and below an abandoned beaver-dammed stream on the Missouri National Recreation River at Bow Creek Recreation Area in Cedar County, NE, which contains both native fish and introduced fish. Fish sampled at Bow Creek Recreation Area were primarily water column feeding fish and the stage of aquatic insects consumed varied across species. Fish exclusion cages yielded higher emergent insect biomass above the former beaver dam, and terrestrial spider densities were higher above cages without fish than with fish. Results from our research will help to determine the direct and indirect effects of fishes on ecosystems, allow for the testing of new theory in ecology about the role of size-structured prey, introduce the potential role of fish species loss or introduction in linked aquatic-terrestrial food webs, and help to guide the conservation and management of the freshwater ecosystems.

Tennessee

Student: Taylor D Payne
Research Institution: University of Tennessee at Knoxville
Lead Student Home Institution: University of Tennessee at Knoxville
Lead Student Home State: TN
Faculty Advisor: Dr. Bhavya Sharma
Division: Chemistry
Poster Title: Neurological Disease Detection Using Laser Technology
Display Area: 51

Abstract: Neurological diseases are difficult to detect in the early stages when treatment would be most beneficial. Many of these diseases are characterized by abnormal concentrations of neurotransmitters in the body. One common method of neurotransmitter detection involves the analysis of biofluids, such as blood or urine, which requires considerable time to gather, purify and process samples. Therefore, there is a need for a more efficient, non-invasive method for the detection of neurotransmitters as biomarkers to indicate neurological disease. The development of a biosensor would lead to earlier detection of these diseases and provide knowledge about their progression. In the Sharma lab at the University of Tennessee, we utilize a form of Raman spectroscopy, a laser-based vibrational spectroscopy, specifically surface-enhanced Raman spectroscopy (SERS), to achieve the detection of several important neurochemicals. Additionally, we combine SERS with another Raman technique, Spatially-Offset Raman Spectroscopy (SORS), to measure neurochemical signals through the skull. We send laser light into the skull, collect the light that returns, and gather information about the chemical concentrations in the brain. We present the development of our method along with results on the SERS detection of major neurochemicals with concentrations in the micromolar to nanomolar range.

Texas

Student: Alexandria M Weiskircher
Research Institution: Midwestern State University
Lead Student Home Institution: Midwestern State University
Lead Student Home State: TX
Faculty Advisor: Dr. Jonathan D Price
Division: Geosciences
Poster Title: Magmatic Timing in an Ancient Rift
Display Area: 52

Abstract: The Wichita Mountains in southwestern Oklahoma expose approximately a dozen granite intrusive bodies (plutons), all part of magmatism within an ancient tectonic rift known as the Southern Oklahoma Aulacogen, a feature that stretched from Dallas, Texas, across Oklahoma, past Amarillo to eastern Utah. At the margin of one of the intrusive bodies, the Quanah Granite Pluton, we noted three rock types. These are (1) the typical coarse-grained facies (CF), (2) fine-grained facies (FF), and (3) porphyritic facies (PF). They are distinguishable based on grain size and mineral content. CF has 6mm mineral grains, FF has 2mm mineral grains, and PF has 5mm larger alkali-feldspar grains with a sub-millimeter matrix. Additionally, the intrusive margin contains several pegmatite bodies, these are coarse-grained igneous pods and linear, intrusive features. Mapping the FF and PF revealed these to have linear, intrusive geometries that cut the CF. To resolve relationships, we assessed the mineral content of the three rock types through petrological and geochemical techniques. Prior researchers noted CF's distinct mineral populations, which include the sodic amphiboles. PF contains the minerals biotite and/or calcic amphibole. FF contains only biotite. The pegmatite bodies contain quartz ± orthoclase ± biotite or sodic amphibole., The textures and mineral assemblages imply that the voluminous CF magma first intruded this area, followed by distinct magma(s) that gave rise to the FF and PF. The difference in texture suggests the FF and PF record the last gasps of magmatism in the rift.

Student: Tara L. Clancy
Research Institution: Del Mar College
Lead Student Home Institution: Del Mar College
Lead Student Home State: TX
Faculty Advisor: Dr. J. Rob Hatherill
Division: Biology
Poster Title: Identification of Antibiotic-Resistant *Ochrobactrum intermedium* and the Utilization of Bacteriophage in Cell Lysis
Funding Agency: National Science Foundation
Grant #: DUE1501207
Display Area: 53

Abstract: There is an ongoing battle between antibiotics and infectious bacteria. The bacteria can transfer antibiotic resistance genes just like one might share a delicious meal with a friend. These bacteria are smart, and have figured out ways in which to resist even the strongest of antibiotics by way of a simple genetic change. This is costing the pharmaceutical companies millions of dollars in research and development, while superbugs seem to always prevail. Bacteriophage are the viruses that can help overcome this crisis. These novel viruses are host specific and will only infect their preferred bacterial host. They can be utilized in many ways, including topical spray, eyedrops, and even taken in pill form. Within my research, I have identified an antibiotic resistant bacterial strain and used bacteriophage to cause the cells to burst, thus killing the cells. The bacteria I isolated, Ochrobactrum intermedium, is known to cause infection during organ transplants and catheter insertion. It also has been known to cause infection in numerous animal species. By allowing the bacteriophage to insert its DNA into the bacteria cell, replicate, and burst cells, this is a promising alternative to antibiotics. This treatment is all natural and the cost associated is far less than reworking and altering antibiotics to try and keep up with the ever-changing population of growing bacteria.

Utah

Student: Madelaine Tesori
Research Institution: Weber State University
Lead Student Home Institution: Weber State University
Lead Student Home State: UT
Faculty Advisor: Dr. Monica J Williams
Division: Health Sciences
Poster Title: Can Policies Mitigate Barriers to Health Care among African Americans?
Display Area: 54

Abstract: Health disparities in African American communities compared to other racial and ethnic groups remains high. This research explores why certain health-care facilities and resources remain underutilized in African American communities in a predominantly White state, and will inform discussions on policy changes and other solutions. Previous research shows some of the barriers to accessing health care are limited access, mistrust, and socioeconomic factors. While health disparities are not improving among younger generations, no previous research has examined the persistence of disparities in access to health care among older and younger populations of African Americans. In collaboration with Project Success Coalition, a nonprofit organization that has worked with African American communities in Utah since 1989, the current study uses a series of four focus groups with both younger and older African American individuals to compare the responses of the different age groups to various health related questions. Preliminary analysis of data from the focus groups has revealed themes not mentioned in previous studies such as cultural factors and food deserts. By helping explain how each generation encounters barriers to health care, the findings from this study will inform discussions on policy changes and other solutions to the problem of undesirable health outcomes within African American communities.

Vermont

Student: Joshua A Sassi
Research Institution: Norwich University
Lead Student Home Institution: Norwich University
Lead Student Home State: VT
Faculty Advisor: Dr. Allison Neal
Division: Biology
Poster Title: Investigation of Parasitic Co-infection in the Western Fence Lizard
Funding Agency: National Institutes of Health National Institute of General Medical Sciences
Grant #: P20GM103449
Display Area: 55

Abstract: Parasitic diseases are a leading cause of illness and death worldwide. In many cases, the causal organisms of such diseases are investigated in isolation, when coinfection with multiple pathogens is actually the norm. Within the host, coinfecting parasites interact with each other and the host immune system. These interactions may affect host mortality by increasing the virulence of disease or impeding treatment. Currently, no method exists to predict the behavior of coinfecting parasites or how interactions may impact the health of the host. Types of interactions exhibited by coinfecting parasites may be assessed by patterns of co-occurrence in the host. Plasmodium mexicanum, a malaria parasite, and its host, the western fence lizard of northern California, have been extensively studied. In prior research, it was revealed that a coinfecting parasite, Schellackia sp., is present, but the relationship between Schellackia sp. and P. mexicanum has not been investigated until now. Since both parasites utilize the blood as a resource, it was hypothesized that the parasites may compete within the host, negatively impacting each other. Blood was collected from lizards at ten locations in northern California and examined via microscopy to determine infection prevalence. Patterns of co-occurrence were used to predict rates of co-occurrence statistical analysis of samples from sites with higher expected rates of coinfection was completed. The number of observed coinfections did not differ from the number expected. This suggests shared resources are not sufficient evidence that parasite interactions will be competitive.

Virginia

Student: Emily A Miller
Research Institution: James Madison University
Lead Student Home Institution: James Madison University
Lead Student Home State: VA
Faculty Advisor: Dr. Joseph Harsh
Division: Education
Poster Title: Assessing the Effectiveness and Impact of a Large-Scale, Two-Semester Course-Based Undergraduate Experience Focused on DNA Barcoding for Introductory Biology Students
Display Area: 56

Abstract: National calls in science, technology, engineering, and mathematics (STEM) education have emphasized the wide-scale engagement of all students in early research experiences in promotion of a workforce and citizenry to attend to the challenges of the twenty-first century (e.g., PCAST, 2012). Beginning in fall 2016, the Department of Biology at James Madison University implemented a two-semester DNA-barcoding focused course-based research experience (CURE) for our large enrollment introductory biology labs. In the first semester, students learn techniques in molecular biology, ecology, and bioinformatics to document campus diversity. During the second semester, students develop and conduct independent research projects using their previously learned skills. To assess the efficacy and impact of the experience, this project analyzed survey data collected—using self-ratings and open-response questions—from students (n=1348, 69% female) near the beginning and end of each course. Overall, students reported shifts in their ability to practice science, affect (e.g., self-confidence), and interest in pursuing later STEM coursework/careers as a result of participation. These outcomes were attributed by students to the authentic nature of the experience marked by high project ownership, the iterative practice of scientific techniques, independence in the research space, collaboration, and the opportunity to learn from failure. Results from this study highlight the contributions of this innovative CURE to student development and will inform future refinements to maximize learning. More broadly, this work may be of interest to faculty at other institutions seeking to adopt a comparable experience for their students.

Washington

Student: Jasmine Yu Graham
Research Institution: University of Washington
Lead Student Home Institution: University of Washington
Lead Student Home State: WA
Faculty Advisor: Dr. Eric Seibel
Division: Engineering
Poster Title: Predicting Tooth Decay with a Non-Contact pH Measurement
Funding Agency: National Science Foundation
Grant #: 1631146
Display Area: 57

Abstract: Dental caries, also known as cavities or tooth decay, causes inflammatory pain and infections in billions of people worldwide. Caries is caused by acids from the metabolism of oral bacteria. These low pH acids dissolve the mineral structure in tooth enamel and dentin, forming cavities. We aim to rapidly assess caries risk with an optical, non-contact wand in the dental clinic. Our patent-pending technique uses an optical pH measurement of the oral bacteria in plaque to predict the risk of caries for the underlying enamel. To accomplish this, we have correlated the fluorescence spectral shifts of two dyes, fluorescein sulfonic acid and rhodamine B, with pH changes measured after a sugar rinse in an oral biofilm. The 580 nm fluorescence peak of rhodamine B does not shift with pH, while the 515 nm peak intensity of fluorescein sulfonic acid decreases over two times from pH 4 to 7. The ratio of the 580 nm and 515 nm peak intensities is linearly related to the pH of the dyed biofilm. Incorporating these results, we are designing a high specificity spectral analysis device to quantitatively measure caries bacteria activity using a non-contact measurement of pH. If successfully translated to the clinic, this novel device and method will allow targeted application of preventative therapies before non-reversible tooth damage occurs.

West Virginia

Student: Morgan Rachelle Menke
Research Institution: West Virginia University
Lead Student Home Institution: West Virginia University
Lead Student Home State: WV
Faculty Advisor: Dr. Natalia Schmid
Division: Engineering
Poster Title: Blind Search of Isolated Astrophysical Pulses in Phased Array Feed Data
Display Area: 58

Abstract: 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.

Wisconsin

Students: Winifred Virginia Redfearn | Simone DeVona Rand | Victoria Jean Kosobucki | Elizabeth Suzanne Larrison | Deja M Roberson
Research Institution: University of Wisconsin–Platteville
Lead Student Home Institution: University of Wisconsin–Platteville
Lead Student Home State: WI
Faculty Advisor: Dr. Eugene Richard Henry Tesdahl
Division: Arts & Humanities
Poster Title: African American Lead Miners in Wisconsin
Display Area: 59

Abstract: In 1827 a lead mining rush engulfed the Driftless Region of the Upper Mississippi River Valley causing an economic boom in southwest Wisconsin and neighboring parts of Iowa and Illinois. This boom helped transform Wisconsin into a territory and then a state by 1848. The Northwest Ordinance of 1787 had forbidden the owning of slaves in the Midwest but lax enforcement permitted slavery in Wisconsin on the eve of statehood. An estimated 100 free and enslaved African Americans along with thousands of miners from France, England, and Wales provided labor during the state's lead rush. Our research group examined hundreds of original manuscripts, an 1845 lead mine, and the grave markers of African American miners to reveal the story of how black lead miners helped build Wisconsin from 1827 to 1903. Our research revealed that the first Territorial Governor of Wisconsin, Henry Dodge, and one of the first governors of Iowa, George W. Jones, both owned slaves that worked mines of the region, and a freeman, James D. Williams came to Wisconsin after the Civil War to establish his own mine near Mineral Point. These underappreciated Americans offer invaluable lessons on the American experiment. A deeper appreciation of nineteenth-century African American lead miners of the Midwest illuminates American successes and challenges before and after the US Civil War that resonate still today.

Student: Kirill Shmilovich
Research Institution: University of Wisconsin–Milwaukee
Lead Student Home Institution: University of Wisconsin–Milwaukee
Lead Student Home State: WI
Faculty Advisor: Dr Ionel Popa
Division: Engineering
Poster Title: Mathematically Modeling Protein-Based Hydrogels
Funding Agency: National Science Foundation
Grant #: 1129056 and 1626450
Display Area: 60

Abstract: The human body does a remarkable job of passively maintaining our livelihoods. At the forefront of this endeavor is one of the fundamental biological units: the protein. Proteins are the workhorses of our bodies, facilitating an enormous amount of biological functions from digestion to learning and memory. Protein hydrogels are an interconnected network of these proteins, whose specific three-dimensional structure correlates to their function within the body. Deriving from this fundamental biological unit, protein hydrogels naturally embrace a variety of biomedical applications, from scaffolding for artificial tissues to controlled drug delivery systems. Subject to external forcing the protein structure unravels and extends, in a process called protein folding, affecting the unique mechanical properties characteristic of protein hydrogels. Here, we present a theoretical model which considers this folding phenomenon to describe the mechanical responses of protein hydrogels. Our model accurately predicts the unique extension of protein hydrogels, while corroborating measurements performed at the single molecule level. Ultimately, this could become a valuable resource for helping to design and produce biomaterials with tunable elasticity. Protein hydrogels have proven versatile in their application, able to mimic complex tissues and processes within the body (such as the muscle contraction of the gut and heart), with the additional ability to controllably retain and release drugs from within their structure. This model could allow researchers to forgo costly and time-consuming experiments to discern the inputs required in producing protein hydrogels specific to their application, effectively expediting the development of smart biomaterials.

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