The posters presented were supported by the generosity of many governmental and private funders, including:

<table>
<thead>
<tr>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Forestry Experimental Station Hatch Grant H45</td>
</tr>
<tr>
<td>American Chemical Society</td>
</tr>
<tr>
<td>American Society of Microbiology 2016 Undergraduate Research Capstone</td>
</tr>
<tr>
<td>American University Department of Computer Science Bridgewater State University, Undergraduate program</td>
</tr>
<tr>
<td>Center for Undergraduate Research (University of Maine)</td>
</tr>
<tr>
<td>Department of Defense</td>
</tr>
<tr>
<td>Department of Education</td>
</tr>
<tr>
<td>Duquesne University Biomedical Engineering Scholarship Fund</td>
</tr>
<tr>
<td>Eagle Scholars Program for Undergraduate Research</td>
</tr>
<tr>
<td>Eastern Connecticut State University</td>
</tr>
<tr>
<td>Florida Atlantic University</td>
</tr>
<tr>
<td>Frederick Douglass Distinguished Scholars</td>
</tr>
<tr>
<td>Funding for Undergraduate Student Excellence (FUSE) Grant</td>
</tr>
<tr>
<td>GEMS Student Scholarship-supported by the National Science Foundation</td>
</tr>
<tr>
<td>Herschel and Caryl Roman Scholarship</td>
</tr>
<tr>
<td>Hooper Undergraduate Research Award</td>
</tr>
<tr>
<td>Indiana State University</td>
</tr>
<tr>
<td>John Deere</td>
</tr>
<tr>
<td>Kenneth E. Sawin Endowment at Coastal Carolina</td>
</tr>
<tr>
<td>Lake Champlain Research Consortium</td>
</tr>
<tr>
<td>Levinson Emerging Scholars Award</td>
</tr>
<tr>
<td>Lintilhac Foundation</td>
</tr>
<tr>
<td>Mary Gates Undergraduate Research Scholarship</td>
</tr>
<tr>
<td>McNair Scholars Program</td>
</tr>
<tr>
<td>Middlebury College Senior Research Fund</td>
</tr>
<tr>
<td>Minnesota State University Foundation Board</td>
</tr>
<tr>
<td>Minnesota State University Undergraduate Research Center</td>
</tr>
<tr>
<td>Mississippi IdeA Network for Biomedical Research Excellence</td>
</tr>
<tr>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>National Security Education Program Boren Scholarship</td>
</tr>
<tr>
<td>National Science Foundation</td>
</tr>
<tr>
<td>National Science Foundation Experimental Program to Stimulate Competitive Research</td>
</tr>
<tr>
<td>National Science Foundation Research Experiences for Undergraduates</td>
</tr>
<tr>
<td>Noyce Scholarship</td>
</tr>
<tr>
<td>NSF-ASSIST Center for Advanced Self Powered Systems of Integrated Sensors and Technologies Center</td>
</tr>
<tr>
<td>Purdue University</td>
</tr>
<tr>
<td>St. Catherine University Summer Scholars Grant</td>
</tr>
<tr>
<td>STAR Scholars Program at Drexel University</td>
</tr>
<tr>
<td>Student Opportunity for Academic Research Scholarship</td>
</tr>
<tr>
<td>The Bill and Melinda Gates Millennium Scholarship</td>
</tr>
<tr>
<td>The Department of Communications, Media, and Language</td>
</tr>
<tr>
<td>University of New Hampshire Hamel Center for Undergraduate Research International Research Opportunities Program</td>
</tr>
<tr>
<td>University of South Florida’s undergraduate research office</td>
</tr>
<tr>
<td>U.S Army Research Office</td>
</tr>
<tr>
<td>USU Office of Research and Graduate Studies</td>
</tr>
<tr>
<td>West Virginia University PSCOR</td>
</tr>
</tbody>
</table>
Dear Posters on the Hill Attendees:

Congratulations to all of our undergraduate researchers on their selection to participate in the 2017 Posters on the Hill. This is our 21st annual Posters on the Hill event and follows the seventh annual Undergraduate Research Week, held from April 3-7, 2017.

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. The Council on Undergraduate Research (CUR) is very impressed by their accomplishments and is pleased that they have been able to come to Washington, D.C., to participate in this prestigious event.

We are also proud of the faculty advisors 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 them for their 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 benefitted from its association with the 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. And I have no doubt, you will help advance knowledge through your research discoveries. Like Sarah Caudill, a Posters on the Hill awardee in 2006, member of the research team responsible for the "discovery of the century"—gravitational waves—and this year's CUR Honorary Fellow, you may rightly credit the research started while an undergraduate as the first step toward an amazing research advance. Many of you will likely continue to be part of research teams that will push the boundaries of knowledge forward.

All of you will find that whether you pursue a career in academia, business, industry, or public service that 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, D.C., when one of your students presents his or her research at Posters on the Hill. Or maybe, 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 26, 2017
5:30-7:30pm-Rayburn Office Building, B357

<table>
<thead>
<tr>
<th>State</th>
<th>Student(s)</th>
<th>Research Institution</th>
<th>Display Area</th>
<th>Abstract page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Haley Beth Turner</td>
<td>The University of West Alabama</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Arizona</td>
<td>Heather Mead</td>
<td>Northern Arizona University</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Arkansas</td>
<td>Monica Brooke Johnson</td>
<td>Brooke Elizabeth Jones</td>
<td>Taylor Lee</td>
<td>Caitlyn Gosch</td>
</tr>
<tr>
<td>California</td>
<td>Ashley Elizabeth Le-Pham</td>
<td>California State University, Fullerton</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Natalie M Aguirre</td>
<td>Marissa Elena Ochoa</td>
<td>Pepperdine University</td>
<td>5</td>
</tr>
<tr>
<td>Connecticut</td>
<td>Jenette Eloise Phillips</td>
<td>University of Connecticut</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Kayla G Giordano</td>
<td>Eastern Connecticut State University</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>
## Delaware

**Student(s):** Lily Soon Neff  
**Research Institution:** Wesley College  
**Display Area:** 9, Abstract page #13

## District of Columbia

**Student(s):** Eric B Vignola | Arunpreet Sandhu  
**Research Institution:** American University  
**Display Area:** 8, Abstract page #14

## Florida

**Student(s):** Charles W Pratt  
**Research Institution:** Florida Atlantic University  
**Display Area:** 10, Abstract page #14

**Student(s):** Taylor Jeanne Emmons  
**Research Institution:** University of South Florida  
**Display Area:** 11, Abstract page #15

## Georgia

**Student(s):** Nikhil Gangasani  
**Research Institution:** University of Georgia, Complex Carbohydrate Research Center  
**Display Area:** 12, Abstract page #15

## Illinois

**Student(s):** Matthew A Kavanaugh  
**Research Institution:** University of Illinois at Urbana-Champaign  
**Display Area:** 14, Abstract page #16

## Indiana

**Student(s):** Dana Kathryn Oakes  
**Research Institution:** Indiana University Purdue University Indianapolis  
**Display Area:** 15, Abstract page #16

**Student(s):** Joshua David Pigg | Matthew Barley  
**Research Institution:** Indiana State University  
**Display Area:** 16, Abstract page #17

**Student(s):** Paige Rudin | Bowman Clark | Caleigh Roleck | Suraj Mohan  
**Research Institution:** Purdue University Main Campus  
**Display Area:** 17, Abstract page #17
**Iowa**

**Student(s):** Chase Grimm  
**Research Institution:** Iowa State University  
**Display Area:** 13, Abstract page #18

---

**Kentucky**

**Student(s):** Kathryn Wilkerson | Lin-hsiu Huang  
**Research Institution:** Morehead State University  
**Display Area:** 18, Abstract page #18

---

**Louisiana**

**Student(s):** Brooke L Mazac  
**Research Institution:** Nicholls State University  
**Display Area:** 19, Abstract page #19

---

**Maine**

**Student(s):** Jessica L Moore  
**Research Institution:** The University of Maine  
**Display Area:** 25, Abstract page #19

---

**Maryland**

**Student(s):** Jesuye T David  
**Research Institution:** Bowie State University  
**Display Area:** 24, Abstract page #20

---

**Massachusetts**

**Student(s):** Huilin Yang  
**Research Institution:** Worcester Polytechnic Institute  
**Display Area:** 20, Abstract page #20

**Student(s):** Mary Grace Donohoe  
**Research Institution:** Stonehill College  
**Display Area:** 21, Abstract page #21

**Student(s):** Melvin Caballero  
**Research Institution:** Bridgewater State University  
**Display Area:** 22, Abstract page #21
Student(s): Natalie S Wellen  
Research Institution: Worcester Polytechnic Institute  
Display Area: 23, Abstract page #22

Michigan

Student(s): Lana Ruvolo Grasser | Michel Kabbash | Mohan Gupta  
Research Institution: Michigan State University  
Display Area: 26, Abstract page #22

Minnesota

Student(s): Chi Na Moua | Courtney Beth Kirkeide | Nicole Szyszka  
Research Institution: St. Catherine University  
Display Area: 27, Abstract page #23

Student(s): Jamie Mae Siemsen  
Research Institution: College of Saint Scholastica  
Display Area: 28, Abstract page #23

Student(s): Katie Lynn Rubitschung  
Research Institution: Minnesota State University, Mankato  
Display Area: 29, Abstract page #24

Mississippi

Student(s): Britton A Strickland  
Research Institution: The University of Southern Mississippi  
Display Area: 31, Abstract page #24

Student(s): Maya Rex  
Research Institution: The University of Southern Mississippi  
Display Area: 32, Abstract page #25

Missouri

Student(s): Kara Schulte  
Research Institution: University of Missouri-Columbia  
Display Area: 30, Abstract page #25

Nebraska

Student(s): Britny Cordera Doane  
Research Institution: University of Nebraska at Omaha  
Display Area: 35, Abstract page #26
<table>
<thead>
<tr>
<th>Location</th>
<th>Student(s):</th>
<th>Research Institution:</th>
<th>Display Area:</th>
<th>Abstract page</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hampshire</td>
<td>Alison Jeffrey</td>
<td>Knysna Elephant Park (South Africa) and University of New Hampshire</td>
<td>36</td>
<td>#26</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Mi-Yeon Park</td>
<td>The College of New Jersey</td>
<td>37</td>
<td>#27</td>
</tr>
<tr>
<td>New York</td>
<td>William Marmor</td>
<td>Rochester Institute of Technology</td>
<td>38</td>
<td>#27</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Hanan Alexandra Hsain</td>
<td>North Carolina State University</td>
<td>33</td>
<td>#28</td>
</tr>
<tr>
<td>North Dakota</td>
<td>Niklas Ernst</td>
<td>Valley City State University</td>
<td>34</td>
<td>#28</td>
</tr>
<tr>
<td>Ohio</td>
<td>Robin M.P. Morillo</td>
<td>The College of Wooster</td>
<td>39</td>
<td>#29</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>Austin Doughty</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Oregon

Student(s): Benjamin M Whitenack
Research Institution: Lewis & Clark College
Display Area: 41, Abstract page #30

Student(s): Quentin John Ward
Research Institution: University of Portland
Display Area: 42, Abstract page #30

Pennsylvania

Student(s): Andrea Nicole Sajewski
Research Institution: Duquesne University
Display Area: 43, Abstract page #31

Student(s): Anuranita Gupta
Research Institution: Drexel University College of Medicine
Display Area: 44, Abstract page #31

South Carolina

Student(s): Kerry Wisdom Dittmeier
Research Institution: Coastal Carolina University
Display Area: 45, Abstract page #32

South Dakota

Student(s): Joseph Mammo
Research Institution: University of South Dakota
Display Area: 46, Abstract page 32

Tennessee

Student(s): Collin Thomas Prusak
Research Institution: Milligan College
Display Area: 47, Abstract page #33

Student(s): Emma Selner
<table>
<thead>
<tr>
<th>State</th>
<th>Student(s)</th>
<th>Research Institution</th>
<th>Display Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>Courtney May Tee</td>
<td>Abilene Christian University at CitySquare</td>
<td>49, Abstract page #34</td>
</tr>
<tr>
<td></td>
<td>Evelyn Villarreal</td>
<td>University of Texas at El Paso</td>
<td>50, Abstract page #34</td>
</tr>
<tr>
<td>Utah</td>
<td>Jenna M. Bouvang</td>
<td>Utah State University</td>
<td>51, Abstract page #35</td>
</tr>
<tr>
<td>Vermont</td>
<td>Julia Christine Wagner</td>
<td>Saint Michael's College</td>
<td>53, Abstract page #35</td>
</tr>
<tr>
<td></td>
<td>Perri Silverhart</td>
<td>Middlebury College</td>
<td>54, Abstract page #36</td>
</tr>
<tr>
<td>Virginia</td>
<td>Sydney Brown</td>
<td>Virginia Commonwealth University</td>
<td>52, Abstract page #36</td>
</tr>
<tr>
<td>Washington</td>
<td>Liesl Grace Strand</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Research Institution: University of Washington  
Display Area: 55, Abstract page #37

West Virginia

Student(s): Amanda Smythers  
Research Institution: Marshall University  
Display Area: 59, Abstract page #37

Student(s): Sundus Sakeena Lateef  
Research Institution: West Virginia University  
Display Area: 60, Abstract page #38

Wisconsin

Student(s): Alexis C Econie  
Research Institution: University of Wisconsin-Stout  
Display Area: 56, Abstract page #38

Student(s): Rebecca Tolfa  
Research Institution: University of Wisconsin-Oshkosh  
Display Area: 57, Abstract page #39

Student(s): Samantha Bartnik | Adam Wiest | Carly Mueller  
Research Institution: University of Wisconsin-Eau Claire  
Display Area: 58, Abstract page #39
Alabama

Student(s): Haley Beth Turner
Research Institution: The University of West Alabama
Lead Student Home Institution: The University of West Alabama
Lead Student Home State: AL
Faculty Advisor(s): Dr. Mustafa Morsy
Division: Biology
Poster Title: “Discovery of Novel Antibiotics to Fight Antibiotic-Resistant Bacteria”
Display Area: 1
Sponsoring Agency: National Science Foundation
Grant #: 1354050

Abstract: Antibiotic resistance is a serious problem worldwide due to the overuse of antibiotics. In the United States, 23,000 people die every year from infections caused by antibiotics-resistant bacteria or “super bugs.” We participated in the Small World Initiative (SWI), which is an innovative program that encourages students to pursue careers in science while addressing a real-world health threat – the diminishing supply of effective antibiotics. We collected soil samples from East Mississippi and West Alabama, isolated diverse bacteria, tested these bacteria against clinically relevant microorganisms, and characterized those showing inhibitory activity. We isolated nearly 2,000 diverse bacterial colonies and tested them against the ESKAPE pathogens safe relatives (Pseudomonas putida, Escherichia coli, and Staphylococcus epidermidis) and Salmonella Newport. We identified 71 unknown bacteria as antibiotic producers that produces inhibition zones on one or more of the tested pathogens. Antibiotic producers were characterized by the Biolog Omni log 96-well plates, which uses 94 different phenotypic tests, including 71 carbon source utilization assays and 23 chemical sensitivity assays for bacterial identification. In addition, antibiotic producers will identified via PCR amplification and sequencing of 16S rDNA. Isolate #4 inhibited S. Newport (a food poisoning causing bacteria) was identified as Serratia marcescens using both 16S rDNA sequencing and the Biolog analysis. Chemical extractions were done for selected antibiotic producing bacteria and the extractions demonstrated that the antibiotic activity is retained when extracted and thus have compounds in solution. The chemical nature of the antibiotics produced are being determined using whole metabolome analyses and mass spectroscopy methods.

Arizona

Student(s): Heather Mead
Research Institution: Northern Arizona University
Lead Student Home Institution: Northern Arizona University
Lead Student Home State: AZ
Faculty Advisor(s): Dr. Bridget Marie Barker
Division: Biology
Poster Title: “Comparing the Differential Expression Utilized During Fungal Morphogenesis Between Pathogenic and Attenuated Strains of Coccidioides posadasii, the Causative Agent of Valley Fever”
Display Area: 3
Sponsoring Agency: Hooper Undergraduate Research Award

Abstract: The human pathogenic soil dwelling fungi, Coccidioides immitis and C. posadasii, can be found in arid regions of the United States. These fungi cause the disease coccidioidomycosis, also known as valley fever. There are at least 150,000 new human cases of valley fever each year in the United States. Valley fever typically presents as a respiratory infection but is also known to disseminate throughout the body. There is not an approved vaccine for valley fever; currently both treatment and diagnostics are limited for these fungal infections. Both species of fungi have a complex life cycle that changes dramatically upon exposure to a mammalian lung. What causes the morphological switch is not well characterized but it is generally agreed that the change in morphology is required to initiate host infection. From a research perspective understanding what cause the switch to a parasitic lifecycle is key in progressing more effective diagnostics, treatments and vaccines. This study compared the transcriptome (gene expression at a moment in time) of the fungi’s soil dwelling life cycle and parasitic life cycle between two strains of the Coccidioides fungi. One strain is highly pathogenic and the other an attenuated derivative. This comparison will elucidate the genetic pathways that are affected by attenuation and are therefore crucial to pathogenesis and establishment of infection. This research will contribute to the understanding of this fungal pathogen that impacts the lives of thousands of United States residents every year.
Arkansas

**Student(s):** Monica Brooke Johnson | Brooke Elizabeth Jones | Taylor Lee | Caitlyn Gosch  
**Research Institution:** Henderson State University  
**Lead Student Home Institution:** Henderson State University  
**Lead Student Home State:** AR  
**Faculty Advisor(s):** Dr. James Engman  
**Division:** Biology  
**Poster Title:** “Metagenomic DNA Sequencing of Bacteria from Cave Crickets Reveals Diverse and Complex Ecological Relationships in an Extreme Environment”  
**Display Area:** 2

Abstract: Cave and other subterranean microbial communities provide examples of organisms adapted to extreme environments (extremophiles) and are increasingly looked at as models for what life on Mars may be like. The unique adaptations of extremophiles also make them excellent candidates for sources of novel biological compounds. We use molecular genetic techniques to survey the bacterial flora of Blanchard Springs Caverns, Arkansas, the most biologically diverse cave in the Ozark Plateau. Recent work concentrates on the flora of the cricket Ceuthophilus gracilipes, the most common organism in the cave. Cricket biomass constitutes a significant portion of the available energy in the cave, making them a keystone (pivotal) species in that ecosystem. No previous work on cave cricket microbes has been published. We have examined the bacteria of the exoskeletal surface and from the digestive system. Our initial techniques depended on culturing bacteria in the lab, and sequencing the DNA of colonies that grew. This method is highly selective, as most bacteria from environmental samples do not grow under laboratory conditions. Recently, we have used metagenomic sequencing, eliminating the need for culturing, potentially identifying all bacteria in samples. This has increased our bacterial species identified from 9 species to over 200. Many of these have unique adaptations and provide great insight into the energetics and complexity of systems that have traditionally been considered very simple. Some bacteria from our samples have DNA sequences distinct enough from any published elsewhere to be considered new species.

California

**Student(s):** Ashley Elizabeth Le-Pham  
**Research Institution:** California State University, Fullerton  
**Lead Student Home Institution:** California State University, Fullerton  
**Lead Student Home State:** CA  
**Faculty Advisor(s):** Dr. Christopher R Meyer  
**Division:** Chemistry  
**Poster Title:** “Starch Bioengineering—An Attempt to Combat Global Food Insecurity”  
**Display Area:** 4  
**Sponsoring Agency:** National Science Foundation  
**Grant #:** 448676

Abstract: Food insecurity is a growing concern globally due to changing climate and diminishing land and resources. Statistical evidence show that our current agricultural methods will not be able to provide for our growing population within the next 50 years. This evidence has caused increased concern and demand for more effective and sustainable practices. While genetically modified organisms (GMOs) and effective chemical fertilizers are at the forefront of this growing challenge, it will not be enough to meet the agricultural demand. In an attempt to mitigate both the future agricultural need and future climate change, we are looking to bioengineering to optimize starch production in plants. Starch has many uses—it is a staple in the human diet, it is a renewable and biodegradable source of carbon, and it could be used for the production of biofuels. We theorize that we can increase starch production by engineering and mutating the enzyme, ADP-Glucose Pyrophosphorylase (ADPG PPase), the critical protein involved in starch synthesis. This project, in particular, is looking at one single mutation in ADPG PPase in the bacterial species Deinococcus radiocurans and it has shown promise with increased starch production that were measured by enzyme kinetic assays. After more is known about ADPG PPase, plant-based research will be the next step. In addition to addressing the challenge of food insecurity, this project is also attempting to mitigate further climate change by capturing the common greenhouse gas, carbon dioxide $CO_2$, and by providing more biofuel resources for clean energy.
Student(s): Natalie M Aguirre | Marissa Elena Ochoa  
Research Institution: Pepperdine University  
Lead Student Home Institution: Pepperdine University  
Lead Student Home State: CA  
Faculty Advisor(s): Dr. Stephen D. Davis  
Division: Biology  
Poster Title: “Severe Dieback in a Keystone Chaparral Species in the Santa Monica Mountains Is Associated with Unprecedented Drought in Southern California”  
Display Area: 5  
Sponsoring Agency: National Science Foundation  
Grant #: REU Site # I560352, IUSE # I525878

Abstract: California experienced unprecedented drought between 2012 and 2016, possibly reflecting early stages of climate change. We examined the mechanism of drought-induced mortality for a keystone chaparral species, laurel sumac (Malosma laurina), in the coastal Santa Monica Mountains. This chaparral species typically provides persistent cover in fire-prone environments due to vigorous resprout success and slope stability in rugged landscapes due to unusually deep roots penetrating soils more than 43 ft. Since drought can limit the ability of native plants to block fungal infection and invasive spread, our research focused on the mechanism by which dieback in laurel sumac is caused by a fungal-induced decline in stem water transport. Tissues from dieback and healthy controls were aseptically transferred to media for the cultivation of fungi. Nearly 100% of samples from tissues of dieback plants contained a fungal pathogen (Botryosphaeria dothidea), whereas 0% of adult healthy plants contained the pathogen (n = 20). Stem water transport was greatly reduced for infected plants compared to healthy controls. Our results were consistent with our initial hypothesis that severe drought in southern California predisposes laurel sumac to fungal-induced dieback. Koch’s postulate (used by Robert Koch to prove the germ theory of disease) was supported by inoculating potted plants and re-isolation of the same fungus after symptoms developed. Taken together, persistent drought in California and continued dieback of laurel sumac will likely increase the invasion of non-native weeds into chaparral stands, leading to reduced slope stability, an increase in fire frequency, further impairing ecosystem services.

Student(s): Jenette Eloise Phillips  
Research Institution: University of Connecticut  
Lead Student Home Institution: University of Maryland Baltimore County  
Lead Student Home State: MD  
Faculty Advisor(s): Dr. Arash Esmaili Zaghi  
Division: Biology  
Poster Title: “Implementation of Advanced Three-Dimensional Scanning Technology for the Safety Evaluation of Bridges with Corrosion Damage”  
Display Area: 6  
Sponsoring Agency: National Science Foundation Research Experience for Undergraduates (REU) at the University of Connecticut (REU Site: Research Experience in Cyber and Civil Infrastructure Security for Students with ADHD: Fostering Innovation)  
Grant #: 1461165

Abstract: Our nation faces a significant challenge with aging bridge infrastructure. The average age of the nation’s bridges is currently 42 years. Approximately 67,000 of the nation’s bridges are rated as structurally deficient. The Federal Highway Administration estimates that an investment of $20.5 billion annually is needed to repair and replace deficient bridges by 2028, while only $12.8 billion is being spent. Thus, there is a critical need for innovative solutions to this grand challenge. To prioritize repair funding, there exists a need for cost-effective and reliable on-site inspection methods that enable accurate estimation of the remaining capacity of bridges with corrosion damage. A novel method was developed using 3D scanning technology to perform precise measurements of the depth and pattern of corrosion at girder ends caused by leakage of deicing salts. This data was used to construct realistic structural models of the beams and use computer simulations to obtain the remaining capacity of the corrosion damaged bridges to evaluate their safety. A series of structural experiments were performed on beam ends with corrosion damage from a demolished old bridge to confirm the simulation data. Advanced imaging techniques were used to find the distribution of stresses under loading and how they change when corrosion damage exists. This technology has the potential to revolutionize how bridge inspection and evaluation is performed, thereby enhancing the safety of aging bridge infrastructure and helping the stewardship of limited federal and state funds.
**Student(s):** Kayla G Giordano  
**Research Institution:** Eastern Connecticut State University  
**Lead Student Home Institution:** Eastern Connecticut State University  
**Lead Student Home State:** CT  
**Faculty Advisor(s):** Dr. William Salks  
**Division:** Social Sciences  
**Poster Title:** “Going Negative: The Effects of Direct Mail Programs on Political Campaigns”  
**Display Area:** 7

Abstract: Every year, Americans make choices about who they want to represent them at the local, state, and national governments. As such, political scientists have long grappled with the question, “How do voters decide?” This study investigates one facet of the modern political campaign which may affect election outcomes: direct mail programs. More specifically, this research aims to understand how negative political mail influences voter attitudes, behaviors, and voting decisions on Election Day. This research is a case study of a 2016 Connecticut State Senate Race in which voters who received negative direct mail were sent a mail survey that explored how the content of the mail influenced their perceptions of both candidates in the race and their vote. This particular race is an open seat, removing the influence of the incumbency effect which has limited the findings of previous studies. Additionally, most previous research on the subject of negative direct mail communications has been experimental and not conducted in an actual voting situation. The present study uses real voters who have received real campaign communications in a highly visible and competitive race. Furthermore, this study, unlike others, seeks to add substance to the literature by attempting to understand how voter attitudes toward candidates are altered by campaign mailings, as opposed to its general effects on turnout. By evaluating the effects of negative direct mail on voters, it is hoped that politicians and political scientists can use the results of this study to better understand how voters ultimately decide.

---

**Student(s):** Lily Soon Neff  
**Research Institution:** Wesley College  
**Lead Student Home Institution:** Wesley College  
**Lead Student Home State:** MD  
**Faculty Advisor(s):** Dr. Malcolm J. D’Souza  
**Division:** Chemistry  
**Poster Title:** “Inventory Platform Manages Chemical Risks, Addresses Chemical Accountability, and Measures Cost-Effectiveness”  
**Display Area:** 9  
**Sponsoring Agency:** National Science Foundation EPSCoR, National Institutes of Health, National Aeronautics and Space Administration Delaware Space Grant Consortium  
**Grant #:** IIA-1301765

Abstract: In order to develop best practices for chemical laboratory safety and for chemical management accountability, the freely available online platform, Quartzy, was integrated within our department’s storage and handling protocols. In addition, Quartzy facilitated the digital tracking and dispersal of our hazardous waste inventory. System implementation facilitated stronger teamwork and an improved collaborative culture between the department faculty, the laboratory manager, and the undergraduate laboratory-assistants. Furthermore, besides the incorporation of an improved safety and documentation consciousness, we witnessed greater productivity and efficiencies to monitor chemicals and their associated contaminants, to help reduce our environmental footprint. In addition, there was an annual savings balance of $12,381.53 (August 2015 to August 2016) on a total billing invoice amount of $48,878.78. This project was funded by the National Science Foundation (NSF) EPSCoR grant IIA-1301765 (Delaware-EPSCoR program), and the Delaware INBRE IDEAS program, with a grant from the National Institute of General Medical Sciences – NIGMS (8 P20 GM103446-16) from the National Institute of Health. Further scholarship support from the National Science Foundation S-STEM DUE grant 135554 (Cannon Scholar program), a NASA DE-Space Grant program (NASA.NNX15AI191H), and the State of Delaware DEDO program is also acknowledged.
District of Columbia

Student(s): Eric B Vignola | Arunpreet Sandhu
Research Institution: American University
Lead Student Home Institution: American University
Lead Student Home State: NJ
Faculty Advisor(s): Dr. Joshua McCoy
Division: Mathematics/Computer Science
Poster Title: “Tools for Creating Interactive Storytelling Experiences”
Display Area: 8
Sponsoring Agency: National Aeronautics and Space Administration Space Grant Consortium and the American University Department of Computer Science
Grant #: NNX10AT91H

Abstract: Interactive story experiences based on a computational model of social interaction allow users significantly more freedom when interacting with characters while having those interactions have deep impacts on how the story progresses. However, the input needed to create these story experiences is complex enough to burden authors. A solution to this problem is a new kind of tool that allows users to more easily interface with and understand the complex social worlds they are authoring. The Codex Authoring Tool—a tool that allows for authoring these complex stories—uses data visualization techniques to make it easier for authors to interface with rich computational models of social virtual worlds. These data visualizations can show authors the relationships between different aspects of social life as well as the effects their authoring decisions have on the story world. In order to visualize Ensemble’s data, the computational model of social interaction that Codex interfaces with, the data is converted from a formal description that Ensemble understands to a one that data visualization libraries understand. The Codex authoring tool uses the configuration of Ensemble unique to each story and the visualization library D3 to create an authoring tool that helps users more easily create interactive experiences with socially competent characters.

Florida

Student(s): Charles W Pratt
Research Institution: Florida Atlantic University
Lead Student Home Institution: Florida Atlantic University
Lead Student Home State: FL
Faculty Advisor(s): Dr. Barclay Barrios
Division: Arts and Humanities
Poster Title: “Queer Images: Portraits of LGBTQ Americans”
Display Area: 10

Abstract: Lesbian, gay, bisexual, transgender, and queer identified people are experiencing unprecedented visibility in the media and popular culture. These representations often tend to be flattened images that reduce complex individuals to simplified and limiting categories of identity that exist in contradiction to lived realities of gender and sexual minorities. My current photographic project “Queer Images: Portraits of LBGTQ Americans” aims to expand the boundaries of lesbian, gay, bisexual, transgender, and queer communities by creating theoretically informed photographic images in domestic spaces that juxtapose interpretations of queer identity with lived realities. These images were created over several months of working with the sitter in order to produce portraits that both explore the photographers’ relationship with the sitter and the implications of that persons’ reality. Working broadly with Nayland Blake’s assertion from Curating In a Different Light that “to be queer is to cobble together identity, to fashion provisional tactics at will, to pollute and deflate all discourses” and Judith Butler’s notions of performance, intelligibility, and justice I create photographs of LGBTQ identified people in domestic settings to visualize and create more nuanced understandings of the possibility for queer individuals. Photographing the domestic spaces of the sitter transgresses the fragile private-public aspects of being a queer that are freely expressed in a domestic space.
Abstract: According to the United Nations, 4,798,574 refugees are affected by the civil war and the ensuing violence in Syria. Responding to the ongoing crisis, the exhibition “I Am with Them,” by artist Anne A-R, debuted at the Institut du monde arabe in Paris in May 2016. The exhibition aimed to give a firsthand account of the Syrian tragedy through life-size photographs and videos of the migrants placed strategically to envelop the viewer within the space in order to ignite a public sense of urgency among viewers, and to invite them to confront the “refugees” as individuals. My research considers A-R’s project through the theories of Marshall McLuhan, who warned of the dangers of technologies, and their ability to distance viewers from the artist’s intended message. My analysis of A-R’s exhibition demonstrates how, when used with due diligence, technology can in fact serve the interests of art, rather than interfering with the viewer’s consciousness and demands a responsible interaction in ways that other media may fail. My project investigates the refugee crisis through the lens of art and technology by considering the following question: “In this age of social media, can artistic attempts to promote a sense of humanitarian responsibility be achieved effectively and incessantly through a harmonious union of technology?” I propose contribute to the ongoing discussions about Europe’s refugee paradox by redefining the relationship between art and technology. (1) http://data.unhcr.org/

Georgia

Student(s): Nikhil Gangasani
Research Institution: University of Georgia, Complex Carbohydrate Research Center
Lead Student Home Institution: University of Georgia
Lead Student Home State: GA
Faculty Advisor(s): Dr. Fikri Avci
Division: Biology
Poster Title: “Fighting a Pathogen with Its Own Medicine: Enzymatic Preparation of Carbohydrates for Effective Immune Response”
Display Area: 12
Sponsoring Agency: National Institute of Health, CURO Honors Scholarship
Grant #: 1R01AI123383

Abstract: Pneumococcal diseases like pneumonia are currently a major global health issue. Caused by Streptococcus pneumoniae bacteria, these diseases are responsible for up to 1.6 million annual deaths globally, according to a World Health Organization estimate. In particular, S. pneumoniae serotype III (Pn3) has increasingly victimized children under the age of five, who represent about half of global victims. The worldwide proliferation of microbial resistance to antibiotics accentuates the need for more effective pneumococcal vaccines. Glycoconjugate vaccines, composed of carbohydrates linked to carrier proteins, alleviate this issue. The Pn3 bacterium expresses a carbohydrate coating on its microbial surface called a capsular polysaccharide (CPS). Breaking down this long, complex Pn3 CPS into smaller fragments of suitable size and composition provides an appropriate carbohydrate source for studying how glycoconjugate vaccines activate a protective immune response against Pn3 CPS. In 1931, a bacterium called Bacillus circulans was observed to generate an enzyme which degrades Pn3 CPS into smaller fragments. Through experimentation, we purified the B. circulans enzyme and determined its size, studied the interactions between the enzyme and Pn3 CPS, and determined the means of CPS degradation. Furthermore, we established ideal conditions for the enzymatic degradation of Pn3 CPS, and confirmed the sizes of the main degradation products. Utilizing what is now known about Pn3 CPS and the B. circulans enzyme that degrades it, future research efforts will work toward creating a means of effective protection from the harmful Pn3 bacterial pathogen.
Illinois

Student(s): Matthew A Kavanaugh  
Research Institution: University of Illinois at Urbana-Champaign  
Lead Student Home Institution: University of Kansas  
Lead Student Home State: KS  
Faculty Advisor(s): Dr. Rohit Bhargava  
Division: Engineering  
Poster Title: “Classifying Breast Cancer Tissue by Tumor Grade and Prognosis via FT-IR Microscopy and Machine Learning”  
Display Area: 14  
Sponsoring Agency: National Science Foundation REU Site - Discoveries in Bioimaging  
Grant #: 1461038

Abstract: Breast cancer is a multifaceted disease, influenced by a multitude of factors both genetic and environmental. Research has shown that there are significant differences in diagnosis among pathologists regarding some of the more detailed aspects of cancer screening. Most notably, variation and inaccuracies exist surrounding the determination of patient prognosis, as well as tumor grade. These qualities are essential to developing an optimal treatment plan for the patient. To address the inconsistency and inaccuracy of human diagnosis, we proposed imaging breast cancer biopsy tissue samples with Infrared Microscopy, whose results are then interpreted by machine learning. The algorithm used for this experiment was the Naïve Bayes Classifier, whose decision-making code is based upon conditional probability. By quantifying the accuracy of the classifier on a sample of known identity, we determine which features of the data are being most effective in helping diagnose our sample. These features were given greater impact on the final result, while useless or detrimental features were removed from consideration. The best classifier built to determine overall prognosis was 66% accurate by sample, whereas the best classifier built to determine tumor grade had 69% accuracy. While not fit for clinical application, this was an important step in determining the proper approach to creating the best diagnostic system possible. Alternative algorithms are being considered, and whichever proves itself most effective will be further improved for clinical use.

Indiana

Student(s): Dana Kathryn Oakes  
Research Institution: Indiana University Purdue University Indianapolis  
Lead Student Home Institution: Indiana University Purdue University Indianapolis  
Lead Student Home State: IN  
Faculty Advisor(s): Dr. Imranul Alam  
Division: Health Sciences  
Poster Title: “WNT16 – A Novel Therapeutic Target for the Treatment of Osteoporosis”  
Display Area: 15  
Sponsoring Agency: National Institutes of Health  
Grant #: AG041517, AR053237

Abstract: Osteoporosis is a disease associated with an increased risk of fracture due to reduced bone density and diminished bone quality. An estimated one in two women and one in four men will suffer an osteoporotic fracture in their lifetime, resulting in over 20 billion dollars being spent in the US in 2015 on osteoporotic fracture treatment alone. The most common therapy for this disease, bisphosphonates, serve to prevent bone breakdown; however, only one bone-building or anabolic therapy, parathyroid hormone (PTH), exists to enhance bone formation. In order to maintain the bone mass gain beyond the maximum allowable years of PTH treatment, a need arises for a better anabolic therapy for osteoporosis. Therefore, studies were undertaken to identify novel molecules that will enhance bone formation and sustain positive bone balance at clinically relevant fracture sites. We performed genome-wide association study for bone mineral density (BMD) and risk of fracture involving more than 50,000 human subjects at skeletal sites predominantly affected by osteoporotic fractures. This study identified common variants in the WNT (Wingless-type mouse mammary tumor virus integration site) 16 associated with BMD and fracture risk. We generated a transgenic mouse model that overexpresses Wnt16 in a cell-specific manner to further identify the role of this molecule in skeletal biology. The significant improvement in bone density, structure, and strength in these mice as a result of WNT16 overexpression illustrates the importance of this gene for maintaining healthy bone and indicates its promise as a novel target for anabolic osteoporotic therapies.
Abstract: Children living in urban areas continue to have a higher risk of lead poisoning than those living in rural areas. An often overlooked source of lead exposure is found in urban soils, which store lead introduced to the environment as a result of the past use of leaded gasoline and leaded paints, as well as industrial emissions of lead. While many studies have quantified the distribution of lead across urban areas, few studies have assessed the bioavailability of lead in these urban soils. The samples used in this study were collected in Terre Haute, Indiana. Total lead concentrations for most of the surface soil samples were previously determined, although additional samples were collected in May 2016 from a historical residential district in Terre Haute. Two different geochemical approaches were used to evaluate the lead bioavailability. Samples were identified with soil lead >200 ppm (n = 210) and subjected to an extraction using a simulated gastric solution to measure what could be absorbed in the stomach during digestion. These samples are currently being subjected to an extraction using simulated bile and porcine pancreatin to measure lead that could be absorbed in the intestines. Samples with lead > 1200 ppm (n= 50) were subjected to a sequential extraction that isolates Pb that is associated with different soil components. The results suggest that soil lead previously considered to be not biologically available could be absorbed in significant quantities during digestion.

Abstract: Water phosphate concentrations greater than 25 µg/L are known to drive the growth of harmful algal blooms, which compromise water quality and cost global industry more than ten billion USD in damage annually, yet phosphorus is also a limited resource vital in agriculture. To improve phosphate management, we identified genes putatively responsible for phosphate uptake, storage, and preparation for exportation in the polyphosphate-accumulating organism (PAO) Microlunatus phosphovorus, transformed them into E. coli, and characterized their functions. Concurrently, we built a bioreactor and designed a suite of cost-effective phosphorus reclamation modules (PRMs) around xerogel-immobilized cells for contained multipoint phosphate bioremediation. Xerogel beads are formed through a chemical reaction at room temperature resulting in a porous glass matrix entrapping cells but allowing water, phosphates, and other nutrients to flow through. With continued testing, we expect to see an increased dry-mass percentage of phosphorus in our chassis relative to unmodified E. coli, elucidate cell viability and function within our glass beads, and understand the effective lifespan of our constructs. Through applied genetic, chemical, and mechanical engineering principles we expect to provide a means for preventing harmful algal blooms in both developed and developing countries while also recovering phosphorus for later agricultural use.
Iowa

Student(s): Chase Grimm  
Research Institution: Iowa State University  
Lead Student Home Institution: Iowa State University  
Lead Student Home State: IA  
Faculty Advisor(s): Dr. Stephen B. Gilbert  
Division: Engineering  
Poster Title: “An Agricultural Harvest Knowledge Survey to Distinguish Types of Expertise”  
Display Area: 13  
Sponsoring Agency: John Deere

Abstract: Gaining insight into the unique characteristics of participants during user research is a valuable tool for both recruitment and understanding differences within the target population. This work describes an agricultural harvest knowledge survey that was created for user research studies that observed experienced combine operators driving a combine simulator in virtual crop fields. Two variations of the survey were designed, utilized, and evaluated in two separate studies. Both studies found a difference between low and high knowledge operators’ performance on the knowledge survey in addition to performance differences. Based on the success of this survey as a population segmentation tool, the authors recommend three criteria for the design of future knowledge surveys in other domains: 1) use real-world scenarios, 2) ensure questions are neither too difficult nor too easy, and 3) ask the minimum number of questions to identify operator knowledge successfully. Future research aims to create a tool that can discern between system experts (with deep understanding of the system) and practice experts (who primarily have the wisdom of experience).

Kentucky

Student(s): Kathryn Wilkerson | Lin-hsiu Huang  
Research Institution: Morehead State University  
Lead Student Home Institution: Morehead State University  
Lead Student Home State: KY  
Faculty Advisor(s): Dr. Ann Andaloro  
Division: Social Sciences  
Poster Title: “Hear Me Roar: The Lives and Issues of Modern Women”  
Display Area: 18

Abstract: Hear Me Roar is a Morehead State University TV production that provides the audience with an opportunity to gain a broader understanding of issues important to both women and minorities. Last semester, as producers, we focused our research on using art for a social change and the connection between science and women’s health. In addition to our research-based segments, we scoped out exemplary women in our community and wrote and produced segments featuring their accomplishments in order to project their voices to women viewers. Hear Me Roar is available to unlimited potential viewers online through MSU’s website.
Louisiana

Student(s): Brooke L Mazac  
Research Institution: Nicholls State University  
Lead Student Home Institution: Nicholls State University  
Lead Student Home State: LA  
Faculty Advisor(s): Dr. Cynthia Vavasseur  
Division: Education  
Poster Title: “iTOTS: Exploring the Construct of Time on Task during Technology-Assisted Reading Interventions for At-Risk Youth”  
Display Area: 19

Abstract: As the presence of technology in education expands, researchers and educators are interested in its impact on the field. The use of these educational technologies have been controversial since their introduction, and their impact is still being discovered. At Nicholls State University, teacher education candidates have the opportunity to help students from local schools who may be at-risk or falling behind by facilitating reading intervention using different mediums. Intervention is implemented at times using the iPad and accompanying educational applications. At other times, intervention is more traditional, using books and written activities. This wonderful collaboration of service learning allows pre-service teachers to get experience working with real-time educational technology while allowing Nicholls College of Education candidates to fill a need in the community. The purpose of this study was to determine if the use of the iPad during intervention affected the percentage of time the student spent on task during the session. Using momentary time sampling (Berliner, 1990), the students were observed during intervention and recorded at set intervals of being either on or off task. Each candidate-student pair was recorded three times with the iPad and three times without the iPad. The findings suggest that student time-on-task is higher during intervention using the iPad than with more traditional intervention materials.

Maine

Student(s): Jessica L Moore  
Research Institution: The University of Maine  
Lead Student Home Institution: The University of Maine  
Lead Student Home State: ME  
Faculty Advisor(s): Dr. Robert T Wheeler  
Division: Biology  
Poster Title: “High-Resolution Imaging of Dynamic Fungal Pathogenicity”  
Display Area: 25  
Sponsoring Agency: National Institutes of Health  
Grant #: R15AI094406

Abstract: Candida albicans is a common fungus which resides in most healthy individuals but presents a risk for infection in people with compromised immune systems. In the United States, Candida species are the primary cause of mortality from fungal disease and a leading cause of hospital-acquired bloodstream infections. It is estimated that treatment of Candida bloodstream infections results in an additional month of hospitalization and nearly $50,000 in added costs. Emerging antifungal resistance is an important concern and more effective solutions are needed to reduce this significant disease burden. Understanding how C. albicans invades and interacts with its host in disease is an important step toward improved treatment options. Central to the progression of these invasive and systemic infections is the ability of C. albicans to switch between two morphological forms: a small yeast-like shape and a longer filamentous shape. The “how, when, and where” of C. albicans’ shape-shifting is strongly implicated in the development of disease. Because change in morphology can be due to several underlying factors and has implications in disease progression, the exact role of C. albicans shape-shifting in infection merits further investigation. Using a transparent zebrafish model, we have non-invasively investigated the role of C. albicans morphology and host response over the course of infection in a living host. With high-resolution microscopic imaging of disease progression from initially localized to subsequent bloodstream infection, we have demonstrated the distinct and crucial role of each fungal shape in the pattern of invasion and spread of C. albicans.
Maryland

Student(s): Jesuye T David
Research Institution: Bowie State University
Lead Student Home Institution: Bowie State University
Lead Student Home State: MD
Faculty Advisor(s): Dr. Soo-Yeon Ji
Division: Mathematics/Computer Science
Poster Title: “Designing a Computational Method for Identifying Abnormal Behaviors in Smartphones”
Display Area: 24
Sponsoring Agency: U.S. Army Research Office, Department of Defense Grant
Grant #: W911NF-13-1-0143

Abstract: The infection of smartphone mobile devices by malware is not new and as the ease to create these malware becomes increasingly trivial, dangerous viruses are more readily available. Perhaps the more disturbing news is that top profile antivirus software like VPN, 360 Security and AndroHelm are not very effective in curbing the virus development. Also, many researchers have tried to utilize the dynamic and static detection mechanisms in the war against the spread of viruses (many have made interesting strides) but none has developed a long-lasting solution.

Our systematic approach includes infiltrating uninfected android apps (.apk) with high-profile android malware (e.g., Android.Geinimi) and observing the effects of these viruses on major system features. These features include: hardware (battery, I/O, and device), communication (phone calls, messaging, and networking access), sensor (accelerometers, GPS, etc.)

As preliminary studies, we have been working on selecting and decompiling malware-free android apps (Temple Run.apk, Subway Surf.apk, RidgeRacerDrawAndDrift.apk), altering their manifest files, attaching virus-infected .apk files, and recompiling them into new .apk files. After the data collection phase is done, statistical analyses such as correlation and pattern analyses will be performed to find any common pre-behaviors of the viruses. In addition to our detection algorithm, we intend to develop a database of similarities and differences of the effects of these viruses, which will range from Ransomware to Android/PoweroffHijack to Trojans and so on. This database could be utilized for further research and experimentation.

Massachusetts

Student(s): Huilin Yang
Research Institution: Worcester Polytechnic Institute
Lead Student Home Institution: Worcester Polytechnic Institute
Lead Student Home State: NH
Faculty Advisor(s): Dr. Amy M Peterson
Division: Engineering
Poster Title: “Inkjet-Printed Drug-Releasing Polyelectrolyte Multilayers for Wound Dressings”
Display Area: 20

Abstract: The polyelectrolyte multilayer (PEM) is a complex that is formed by alternating layers of polyanion and polycation. Due to their excellent biocompatibility, PEMs have been used in many medical applications. In particular, PEMs have been used for wound healing because of their multi-antibacterial mechanisms. Traditional PEM fabrication methods are lengthy and require specialized equipment. In this study, the PEM was fabricated in an innovative way by using a commercial inkjet printer. The fabrication time was reduced to one third of that required for the current state-of-the-art dip-coating method, and PEMs were proven to be homogeneously formed on the cotton substrate. To demonstrate their potential application to point-of-care bandages for wound healing, antibiotic gentamicin was loaded onto PEMs using the inkjet printer. 50% of the loaded gentamicin was burst-released in the first five hours and the rest was released consistently at 0.15 ug/(cm^2-h) for at least four days. The antibacterial property of the gentamicin loaded PEM was shown by the zone of inhibition of 1.575 ± 0.03 cm on the E. coli culture. Compared with the zone of inhibition of 1.75 ± 0.04 cm of gentamicin coated cotton paper, the inhibition results also showed the integrity of the gentamicin molecules during the loading process. This inkjet printing method demonstrated a robust PEMs fabrication and antibiotic loading approach. It could potentially provide more versatile and personalized wound healing and do so in a more economical manner.
**Student(s):** Mary Grace Donohoe  
**Research Institution:** Stonehill College  
**Lead Student Home Institution:** Stonehill College  
**Lead Student Home State:** NY  
**Faculty Advisor(s):** Dr. Bettina Scholz  
**Division:** Social Sciences  
**Poster Title:** “Cultivating Unity in Diversity in Post-Conflict Communities: Lessons from Local Catholic Peacebuilders in Nigeria and El Salvador”  
**Display Area:** 21

**Abstract:** In a world where religion is increasingly used to justify violence, a better understanding the benefits and limitations of religious activities in conflict transformation is critical for all policymakers. One Catholic peacebuilding scholar, Maryann Cusimano Love, has argued, along with other scholars, for the broad goal of shifting societal norms from merely eliminating violence towards the cultivation of a sustainable and just peace. This project will focus on unity in diversity, a theological concept that can aid practitioners in the cultivation of these general societal shifts. This concept dissects whether or not the tensions associated with religious violence can be overcome in a way that respects diversity. This project balances attempts to articulate the theological understanding of this concept with the work of peace practitioners. While one model of unity in diversity is not possible, understanding how this concept can motivate action can contribute to a better execution of sustainable peace efforts. This would be a critical contribution not only to broader peacebuilding scholarship and also to Catholic peacebuilding leaders. This study will explore two cases where local Catholic leaders practice these theological principles. What emerges from these cases are two models for realizing unity through diversity via 1) interfaith dialogue in Nigeria and 2) radical accompaniment in El Salvador. Using scholarly analysis, local newspapers, local Catholic peacebuilding organizations, and other sources, this project seeks to advise policymakers and peacemakers in determining the benefits and limits of incorporating religious activities into the cultivation of unity in post-conflict communities.

---

**Student(s):** Melvin Caballero  
**Research Institution:** Bridgewater State University  
**Lead Student Home Institution:** Bridgewater State University  
**Lead Student Home State:** MA  
**Faculty Advisor(s):** Dr. Alba Aragón  
**Division:** Arts and Humanities  
**Poster Title:** “Not Even the Desert Could Stop Me: Crossing Towards an American Dream”  
**Display Area:** 22

**Abstract:** Eight years after immigrating to the U.S. from Honduras as an unaccompanied minor, I have written a memoir of my dangerous journey. I survived many hardships crossing through three countries to enter the U.S. undocumented. I wrote my memoir to bring awareness of the risks and difficulties that migrants face on a daily basis, especially the tens of thousands of unaccompanied minors from Central America who have recently crossed the U.S. border. Their voices are largely absent in media and literature; my project brings to light not only my own experiences, but also those of other immigrants. My research included analyzing journalists’ accounts and interviews of immigrants and government officials, notably Sonia Nazario’s *Enrique’s Journey* and Oscar Martinez’s *The Beast: Riding the Rails and Dodging Narcos on the Migrant Trails*. Fictional narratives such as Mario Bencastro’s *Odyssey to the North* also informed the construction of my work. After establishing a foundation from these texts, I wrote my own story in five chapters. Chapter 1 tells my family’s story, focusing on my father’s struggles working in the fields to raise his children. Chapters 2-4 describe my journey from the moment I said goodbye to my mother to my arrest in Texas, after witnessing violence inflicted on people who may never be able to tell their stories. The last chapter is about my fight for legal status, learning English, gaining U.S. citizenship, and what I have learned about myself in these experiences.
Abstract: A derivative is a financial instrument that determines its value from something else, such as a loan or stock. When a derivative contract is written up between two businesses without being exchanged through a market, it is called an Over-the-Counter (OTC) derivative. The gross notional value of a derivative is the value in dollars referenced by the derivative contract. In the United States, derivatives are traded on the order of trillions in gross notional values, and are further believed to have played a significant role in the 2007-2008 financial crisis. Because of this, regulations were put in place in 2010 that require the financial firms to only trade OTC derivatives through Central Clearing Parties (CCPs). Though these CCPs have been mandated for six years, there is still little understanding of how much safer they make OTC derivative markets. This project creates models of the OTC derivative classes based on the publicly available data of gross notional amounts that each major financial firm trades. From this exposure amounts are estimated, which are the amount that a firm could potentially lose in the worst case from derivative contracts. Trading derivatives in a class without a CCP, with only one CCP, and with multiple CCPs make up the models. In this way they are compared to evaluate the relative stability of each model. Further analysis can also be applied to the models to test the risk associated with a firm going bankrupt.

Michigan

Student(s): Lana Ruvolo Grasser | Michel Kabbash | Mohan Gupta
Research Institution: Michigan State University
Lead Student Home Institution: Michigan State University
Lead Student Home State: MI
Faculty Advisor(s): Dr. Natalie Phillips
Division: Psychology
Poster Title: “Differences in Neural Networks and Attention During a Natural Reading fMRI Investigation”
Display Area: 26

Abstract: Reading is a cognitive task individuals are faced with every day, yet it is a skill negatively impacted in many developmental disorders. Minimal research has focused on functional connectivity networks in a natural reading paradigm. The Digital Humanities and Literary Cognition lab at Michigan State University has sought to remedy this by studying natural reading using two different methods of attention—analytical and pleasure reading. Presenting full paragraphs of text in a functional Magnetic Resonance Imaging (fMRI) scanner allowed participants to read at their own pace, better mirroring functional reading. We are employing an Independent Components Analysis (ICA)—a way to measure the number of factors explaining a dataset—and a dual regression analysis—a mathematical tool used to overcome individual variations when performing a group analysis—to examine the differences in connectivity maps between the two modes of attention in reading. We will demonstrate the interconnection amongst brain networks involved in analytical and pleasure reading over time. Therefore, we can answer questions of how the brain processes and interprets stimuli one has read at different attention levels. We predict that analytical reading will show stronger activation in the left lateralized network (where language centers are known to be clustered) than pleasure reading, which will show greater activation of bilateral networks involved in social interactions due to less inhibition of social networks. Future research could focus on applying these methods to investigate differences between typical and dysfunctional connectivity networks in reading that appear in developmental disorders.
Minnesota

Student(s): Chi Na Moua | Courtney Beth Kirkeide | Nicole Szyszka
Research Institution: St. Catherine University
Lead Student Home Institution: St. Catherine University
Lead Student Home State: MN
Faculty Advisor(s): Dr. Marcella Myers
Division: Health Sciences
Poster Title: “A Novel Gait Trainer Facilitates More Natural Walking Patterns in Adults 65 Years and Older”
Display Area: 27
Sponsoring Agency: St. Catherine University Summer Scholars Grant

Abstract: It is established that one out of five falls in elders 65 years and older may result in a serious injury due to loss of muscular strength and sensory impairments leading to declines in mobility, balance, and independence. Often, conventional 2-wheel and 4-wheel walkers are prescribed to assist people with these issues. However, research has shown that gait patterns degrade from using conventional devices over time. We studied a novel 4-wheel gait training device with upright handle bars and a pivoting frame designed to promote proper posture and facilitate body dynamics through enhanced proprioceptive (body-position) feedback. In a cross-sectional study of healthy older adults (65+; n=18), participants completed three supervised walking trials under four conditions: normal walking; 2-wheel walker; 4-wheel walker; and gait training device. Data on speed, stride length, pelvic rotation, and gait symmetry (similarity of trunk accelerations on the left and right sides) were assessed using an inertial sensor placed on the low back. Our study shows that when walking with the gait trainer, participants walked 4% faster (p=0.02) compared to a 2-wheel walker and showed 18% greater pelvic rotation (p=0.04) compared to a 4-wheel walker. We also observed non-statistically significant trends toward higher gait symmetry using the gait trainer compared to the 2-wheel (2%, p=0.08) and 4-wheel (3%, p=0.07) walkers. These initial findings offer evidence that this new gait trainer promotes more optimal walking patterns compared to conventional walkers, which could prevent falls and enhance the independence and mobility of elders.

Student(s): Jamie Mae Siemsen
Research Institution: College of Saint Scholastica
Lead Student Home Institution: College of Saint Scholastica
Lead Student Home State: MN
Faculty Advisor(s): Dr. Troy Abfalter
Division: Arts and Humanities
Poster Title: “Lockean Identity and the Role of Parodied Recitations in Lewis Carroll’s Alice in Wonderland”
Display Area: 28
Sponsoring Agency: Department of Education, McNair Scholars Program
Grant #: P217A120010

Abstract: Lewis Carroll’s children’s novel Alice in Wonderland is one of the most widely translated and quoted works worldwide. After falling down the rabbit hole, Alice questions the basis of her identity and struggles to explain her uncertainty to the adult figures of Wonderland. She recites poetry as a method securing her identity on the basis of memory. However, when Alice attempts to recite three poems, she produces parodies of those poems instead. Carroll’s three parodies critique moral poems written by Isaac Watts and Robert Southey, undermining the serious emphasis of the original works. Alice’s three parodied recitations are significant to the construction of Alice’s identity on a philosophical level. This study applies John Locke’s philosophy of personal identity to Alice’s character development over the course of the novel, exploring parallels between Locke’s teachings and Alice’s struggle that have not been studied in depth. This interdisciplinary analysis examines the relationship between Lockeian constructions of Alice’s identity and Carroll’s critique of moralistic children’s literature. It reveals a literary shift away from moral didacticism toward a more imaginative lesson encouraging children to independently construct their identities. Given the continued popularity of Carroll’s novel, its literary insights into the significance of childhood constructions of identity persist.
Abstract: Osteoporosis is common in post-menopausal women and is related to reduced levels of estrogen. However, in later years, men also develop osteoporosis as testosterone levels decline. Calcium and phosphorus homeostasis is a complex process involving many different components. More than 99% of total body calcium and phosphorus is stored in bone in the form of phosphate and hydroxide salts. Little information is available concerning the role of testosterone in bone mineralization. The goal of this research is to study bone density, calcium levels, and phosphorus levels in both castrated and non-castrated (control) male C57/BL6 mice. The control group consists of eleven non-castrated male mice. The experimental group consists of eleven mice, which had been anesthetized with isoflurane and castrated using aseptic surgical technique. In variable time periods following surgery, the mice were euthanized and the long bones were harvested and weighed for bone density measurement. Calcium and phosphorus levels were measured using scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDS). The results will provide information about the effect of low levels of testosterone on bone mineralization. Preliminary results show a mineralization decline between the uncastrated (control) mice and castrated (experimental) mice, indicating testosterone levels are a factor affecting bone mineralization. Understanding testosterone's affects on bone mineralization is critical to the treatment of osteoporosis. Federal funding regarding osteoporosis research has remained low and with no recent information posted on the United States Senate website, this research aims to increase the awareness of the importance of osteoporosis research.
Abstract: We tested whether explicit and implicit racial attitudes are driven primarily by skin tone or by both facial features and skin tone in elementary school children. One hundred and twelve children participated in the study. We recruited 5-7 year old children and 8-12 year old children. Sixty five participants were White and 47 were either Black, mixed or Hispanic. Participants completed two tasks measuring implicit and explicit biases. Faces presented varied on skin tone and facial features. In the explicit bias task, participants rated faces presented in a random order. We used a sliding bar presented under each face, which participants slide from left to right to indicate how much they like each face. We employed the affect misattribution procedure (AMP, Payne et al., 2005), adapted for children (Dunham & Emory, 2014). For the implicit bias task participants briefly saw a face and then a Chinese character on each trial. They were asked to judge whether the character is “good” by pressing a smiley face button or “bad” by pressing a frowning face button. The findings from both tasks indicate that implicit and explicit pro-White race-based preferences are largely in place when children enter kindergarten, driven by both skin tone and facial features and similarly exhibited by both White and non-White children.

Missouri

Abstract: Motivation and engagement are central to academic success, but little is known about how differences in gender and socioeconomic status influence motivation and engagement related to math achievement in elementary school students. We examine 5th grade math achievement scores and the possible influence of math motivation and school engagement, controlling for 3rd grade math achievement, math motivation, and school engagement. We utilized data from a nationally representative longitudinal data set (ECLS K-8) to examine males and females within five quintiles of socioeconomic status (SES) as defined by the census. Of the 8,591 students included in the data set, 4,293 were male and 4,198 were female. We used statistical interpretations to predict missing values and generalize statistically significant differences in engagement and math achievement by gender and class. Our findings indicated that math motivation and engagement and math achievement were both significant factors for male math achievement. However, only engagement was significant for females. When the data was broken down by SES, engagement was more important for influencing lower income students; while both factors are important for higher SES students. When biological sex and SES are combined, engagement is the only factor of significance for lower SES males. However, only motivation is significant for higher SES males. Engagement only is significant for females across the board. Evidence-based policy implications include increasing programs to improve female engagement, leading to increasing STEM scores. Classroom engagement activities that focus on active, problem-based learning would be one way to increase engagement.
Nebraska

**Student(s):** Britny Cordera Doane  
**Research Institution:** University of Nebraska at Omaha  
**Lead Student Home Institution:** University of Nebraska at Omaha  
**Lead Student Home State:** NE  
**Faculty Advisor(s):** Dr. Michele Desmarais  
**Division:** Arts and Humanities  
**Poster Title:** “Methods and Madness: Poetry That Explores the Religious Phenomena of Theia Mania”  
**Display Area:** 35  
**Sponsoring Agency:** Funding for Undergraduate Student Excellence (FUSE) Grant

Abstract: For centuries preceding the Renaissance, artistic inspiration was thought to originate from a divine source, rather than the individual. Though this concept is most well-known through the Phaedrus dialogue—in which Plato attributes to Apollo, Dionysus, Eros, and the muses the inspiring of prophetic, ritualistic, erotic, and poetic/artistic mania in humans—the idea of the artist as an instrument of the divine, or a person acting with divine madness, has been a prevailing theme espoused by great artists throughout vastly different cultures, each employing their own terms for divine inspiration, while expressing their mystical traditions through various forms of art. The purpose of my research into divine madness is to facilitate a collection of poetry that reflects upon the parallels between mysticism and artistic expression. Instead of surveying the evolution of our psychological understanding of madness throughout history of the western world, or this notion of the “tormented artist,” the collection explores the sources of the mystic’s divine and the artist’s inspiration—the places where artists and mystics experience the divine or moments of inspiration, the practice in which the divine and inspiration are commixed or conceived, and the divine or fleeting nature of the muse—ultimately reflecting upon the ways in which humanity explores questions and issues related to the “unknown” or the “divine.”

New Hampshire

**Student(s):** Alison Jeffrey  
**Research Institution:** Knysna Elephant Park (South Africa) and University of New Hampshire  
**Lead Student Home Institution:** University of New Hampshire  
**Lead Student Home State:** RI  
**Faculty Advisor(s):** Dr. Vanessa Grunkemeyer  
**Division:** Biology  
**Poster Title:** “The Relationship of Life Stage to Daily Social Patterns of Captive African Elephants (Loxodonta africana) and the Correlation of Handler Perceptions of Elephant Personality to Demonstrated Social Behaviors”  
**Display Area:** 36  
**Sponsoring Agency:** University of New Hampshire Hamel Center for Undergraduate Research International Research Opportunities Program

Abstract: Conservation programs aimed at bolstering the dwindling populations of wild African elephants (Loxodonta africana) are varied and include efforts to protectively house and actively manage captive herds globally. In the United States, these efforts are informed by the Animal Welfare Act enforced by the USDA Animal Care Unit and the Association of Zoos & Aquariums’ Standards for Elephant Management and Care. Gaining a thorough understanding of captive elephant behavior is an important component in continually developing the best guidelines for elephant care. This study was designed to determine how social behaviors among a herd of captive African elephants varied throughout the day and to establish if the frequency of social interactions and age class were correlated. The study also aimed to determine if handler perceptions of elephant personality were an accurate predictor of the type and frequency of social behaviors. The research was performed at the African Elephant Research Unit at Knysna Elephant Park (KEP) in South Africa. The herd included 7 elephants in 3 age groups: juvenile (0-10 years), young adult (11-20 years), and adult (20+ years). Continuous, all-occurrence sampling of pre-determined affiliative, agonistic, and ambiguous social behaviors was performed for a duration 103 hours over seven weeks. Additionally, elephant handlers were surveyed regarding perceptions of individual elephant personality traits, including qualities such as dominance, boldness, and sociability. This characterization was compared to the previously recorded elephant social behaviors. Upon completion of analysis, results are intended to influence the management of captive elephants at KEP and elsewhere.
New Jersey

**Student(s):** Mi-Yeon Park  
**Research Institution:** The College of New Jersey  
**Lead Student Home Institution:** The College of New Jersey  
**Lead Student Home State:** NJ  
**Faculty Advisor(s):** Dr. Jodi Weinstein  
**Division:** Social Sciences  
**Poster Title:** “Postponing the Dream: Korean Reunification, Its Pathways, and Obstacles”  
**Display Area:** 37

Abstract: The deterrence of North Korea’s nuclear activities and prospects for a peaceful Korean reunification remain at the center of the international political agenda. However, dialogues on national and global security regarding North Korea’s nuclear provocations overshadow those on outlining practical, long-term policies and effectively preparing for the ultimate collapse of North Korea and therefore, Korean reunification. This study is an indictment of the international leadership, namely China, South Korea, the United States, and the United Nations, that has failed to change the status quo on the Korean peninsula. The purpose of this research is to provide regional and global comparative analyses on the main actors’ (including North Korean refugees’ and other citizens’) current roles and positions on prospects for reunification, especially in regards to economic benefits and national stability. German reunification is not a model for Korean reunification and so considering different elements such as economic development, food security, migration, transitional justice, and health in this discourse, a range of possible post-reunification scenarios along with potential policies will also be proposed. To support this research, qualitative and quantitative data from primary sources were compiled, and observations and interviews with North Korean refugees and experts on these issues were conducted in China and in South Korea throughout a one-year period. International cooperation is imperative more than ever in preparing for reunification because failing to plan is planning to fail. The results of this research will therefore serve as a tool to guide policymakers in pursuing stronger measures toward Korean reunification.

New York

**Student(s):** William Marmor  
**Research Institution:** Rochester Institute of Technology  
**Lead Student Home Institution:** Rochester Institute of Technology  
**Lead Student Home State:** NY  
**Faculty Advisor(s):** Dr. Christina Collison  
**Division:** Education  
**Poster Title:** “Transforming the Delivery of a STEM Lab: Development and Implementation of Innovative Lab Practices to Enhance Meaningful Learning in an Organic Chemistry Laboratory Curriculum”  
**Display Area:** 38  
**Sponsoring Agency:** National Science Foundation  
**Grant #:** DUE-1625649

Abstract: Development of a more diverse, globally competitive STEM workforce is central to rethinking how undergraduate science majors are trained in a laboratory. Our research involves the development and broadened implementation of innovative and easy-to-adopt organic chemistry lab modules for use throughout an organic chemistry curriculum at both 2-year and 4-year colleges. These modules are designed to achieve the following student learning gains: (i) increased student-student interactions/enhanced student engagement, (ii) improved student confidence in the laboratory, and (iii) better connectivity of course material between the lecture and laboratory. An overview of these modules will be presented along with a description of the instruments used to assess both the reformed nature of the modules and the students’ meaningful learning in the laboratory. The results collected from these assessments will be used to gauge the impact of these laboratory modules on student learning in educational environments that differ by instructor and institution. Further, our assessments will be used to showcase the effects of these modules on student affect and cognition over the course of two semesters in an organic chemistry lab.
North Carolina

Student(s): Hanan Alexandra Hsain
Research Institution: North Carolina State University
Lead Student Home Institution: North Carolina State University
Lead Student Home State: NC
Faculty Advisor(s): Dr. Michael Dickey
Division: Engineering
Poster Title: “Reclaiming Ambient Energy for Portable Electronics: Reverse Electrowetting Energy Harvesting”
Display Area: 33
Sponsoring Agency: National Science Foundation-ASSIST Center for Advanced Self Powered Systems of Integrated Sensors and Technologies Center
Grant #: EEC-11160483

Abstract: According to the Environmental Protection Agency, Americans purchase nearly three billion batteries per year to run cell phones, radios, computers and other portable electronics. These batteries will take decades to decompose, all the while infiltrating groundwater and runoff. As wearable devices increase in popularity and function, it has become apparent that an alternative to batteries is required to not only store, but generate power in a sustainable and low-maintenance manner. Here we describe a system that converts ambient mechanical energy into electricity by modulating the wetting effects of micro-scale water droplets arranged between two metal sheets and a dielectric coating, or insulating material. We conduct a parametric study of dielectrics, surface characteristics, and charge carriers in an effort to optimize the energy harvesting performance for small-scale applications. We demonstrate scalability of our device with an energy density of up to 300 µW/cm², comparable to currently established methods of micro-electronics energy harvesting. Since the average human body can produce 10.5 megajoules per day, an ideal application would be micro shoe inserts that would harvest the mechanical energy of every day human activity. Reverse electrowetting addresses crucial considerations to the wearable electronics industry by its ability to utilize a broad range of mechanical motion, its scalability to larger devices, and its potential to be made cost effectively with sustainable materials. By utilizing human movement, energy that would otherwise go to waste can be used for powering electronics in a manner that is sustainable and continuous.

North Dakota

Student(s): Niklas Ernst
Research Institution: Valley City State University
Lead Student Home Institution: Valley City State University
Lead Student Home State: ND
Faculty Advisor(s): Dr. David M DeMuth
Division: Social Sciences
Poster Title: “The Unfinished Presidencies: Why Incumbent Presidents Lose Their Re-Election Campaigns”
Display Area: 34
Sponsoring Agency: Student Opportunity for Academic Research Scholarship

Abstract: Throughout the history of the United States, 20 presidents won two consecutive terms in the White House, while only 10 lost their second presidential election. While the likelihood for an incumbent president to be re-elected is not as high as in House or Senate races, data demonstrates that incumbent presidents are usually likely to win their bid for a second term. Political science has demonstrated that incumbent presidents have several advantages which they can use in order to gain re-election — i.e., party nomination, name recognition, access to campaign funding and government resources, and campaign machines. The “incumbent advantage” has been thoroughly studied and its theoretical assumptions are well developed. However, despite these advantages, some incumbent presidents are unable to guarantee electoral victories. In the postwar years Presidents Gerald Ford, Jimmy Carter, and George H.W. Bush did not win their re-election bid, despite having access to many of the advantages every other incumbent president had. Accordingly, the current research analyzes what factors contributed to falsifying the incumbent advantage in the cases of Presidents Ford, Carter, and Bush. More precisely, I analyze the factors and dynamics at work in each of these candidacies in order to try to identify a discernible pattern which may subvert the advantages characteristic of incumbents. The development of a theoretical framework explaining the different dynamics involving presidential re-elections allow us to generalize about the relationships between variables and, to the extent possible, construct a general proposition about the success or failure of the incumbency advantage.
Ohio

Student(s): Robin M.P. Morillo  
Research Institution: The College of Wooster  
Lead Student Home Institution: The College of Wooster  
Lead Student Home State: OH  
Faculty Advisor(s): Dr. Niklas Manz  
Division: Physics/Astronomy  
Poster Title: “A Hill on Fire: Using Matches, 3D Printing, and Code as a Forest Fire Analog”  
Display Area: 39

Abstract: The effect that slope has upon forest fire propagation was studied both experimentally and computationally. For the experimental aspect, a forest fire analog was created using matches as model trees inserted into a 3D printed base to produce the desired forest floor geometry. The specific geometry studied was a constant uphill or downhill slope to investigate the effect of the slope angle on the propagation speed. The results are compared to research done by Richard C. Rothermel at the USDA Forest Service. Using a cellular automatone computer simulation, more complex systems were examined, including the formation of spiral waves when treating the forest fire as a reaction-diffusion system.

Oklahoma

Student(s): Austin Doughty  
Research Institution: University of Central Oklahoma  
Lead Student Home Institution: University of Central Oklahoma  
Lead Student Home State: OK  
Faculty Advisor(s): Dr. Wei R. Chen  
Division: Engineering  
Poster Title: “Photothermal and Immunological Effects of Near-Infrared Light in Laser Immunotherapy for the Treatment of Metastatic Cancers”  
Display Area: 40  
Sponsoring Agency: National Institutes of Health and National Science Foundation  
Grant #: 1 R21 EB 015509-01-A1 and DUE-0856396

Abstract: Cancer treatment is most often unsuccessful due to tumor metastasis. An ideal cancer therapy should be capable of destroying the primary tumors and at the same time eliminating cancer metastases at distant sites. Laser Immunotherapy (LIT) is an emerging cancer treatment modality that induces an autologous anti-cancer immune response in the patient using local irradiation by a near-infrared laser and immunological stimulation by local administration glycated chitosan, a novel immunoadjuvant. The photothermal effect of laser irradiation is accompanied by an immunological response that is crucial in LIT. In this study, we investigated the photothermal-immunological effect of LIT in order to understand its mechanism and to improve its efficacy. We studied the temperature distribution in a tumor under laser irradiation ex vivo using a uniquely designed thermal device and in vivo using magnetic resonance thermometry. Then, heat shock protein expression by the tumors after laser irradiation was investigated in vitro. Furthermore, damage associated molecular patterns were identified following LIT treatment of metastatic breast tumors in rats. From these studies, we identified that the optimal temperature range to induce effective immunological response was between 50 to 70°C. Based on our experimental results, we propose that an optimal LIT treatment regimen consists of using an interstitial fiber for tumor irradiation with a laser power of 2 to 3 watts and a duration of 10 minutes. Our results can be used to further advance LIT to become an effective method for patients with late-stage, metastatic cancers who currently face severely limited options.
Student(s): Benjamin M Whitenack
Research Institution: Lewis & Clark College
Lead Student Home Institution: Lewis & Clark College
Lead Student Home State: OR
Faculty Advisor(s): Dr. Shannon O’Leary
Division: Physics/Astronomy
Poster Title: “Using Flickering Laser Light and an Atomic Gas to Detect Unknown Magnetic Fields”
Display Area: 41
Sponsoring Agency: National Science Foundation
Grant #: PHY-1506499

Abstract: Significant advancements in 21st-century physics have relied on the discovery that properties of atoms are not fixed, but can be changed by interactions with laser light. Our ability to understand and control these sensitive interactions are the keys to creating new atom-light based technologies. Our research focuses on how atoms select the light that they absorb and how this selection changes based on the surrounding magnetic field. Such atom-light interactions can be used as the foundation of a device, called an atomic magnetometer, that measures unknown magnetic fields. Using a specially prepared atomic gas, laser light, and a controlled magnetic field we temporarily change the way that the atoms and light interacts. One result is that the transmitted laser light’s brightness flickers in ways that are not yet fully understood, but are a main focus of our research. This laser flicker carries information about the atoms, and is especially sensitive to magnetic field variations. Our work contributes to the scientific understanding of atom-light interactions while simultaneously producing new techniques for detecting small unknown magnetic fields such as those produced by a beating human heart. The new detection methods we propose will potentially impact a broad range of medical and scientific fields. Further, because we make use of low-cost and potentially portable laser systems, resulting technological applications could be widely accessible and suitable for use outside of the laboratory environment. In this poster, we will describe our recent results on the sensitive nature of this laser flickering technique.

Student(s): Quentin John Ward
Research Institution: University of Portland
Lead Student Home Institution: University of Portland
Lead Student Home State: NM
Faculty Advisor(s): Dr. Heather E Dillon
Division: Engineering
Poster Title: “Effects of Angles on Solar Panel Power Output”
Display Area: 42

Abstract: Solar Energy is a promising alternative source of renewable energy that could contribute to the reduction of global warming and pollution. This project investigates maximizing the power output of a photovoltaic solar panel in Portland, Oregon, by researching the possible use of solar tracking technology. Optimal angle for solar panel tilt was determined for stationary panels by observing the average tilt of the panel when solar tracking was enabled. Using a previously designed solar tracking panel, power output was measured between 10am and 3pm on three different days during November 2015. Voltage output measurements were collected using customized solar tracking technology with panels exposed to direct sunlight, cloudy conditions (100% cloud cover) and partial shadow combined with solar panel angles of 22 degrees, the currently recommend optimal angle. These power output values were compared to the 22-degree angle power output to determine percentage change. Results indicated an average increase in power output of 20.2% in direct sunlight, 2.35% increase during cloudy periods, and a 5.5% increase during periods of partial shadow. The optimal angle for maximum solar panel output was determined to be 39 degrees during periods of direct sunlight, 50 degrees in partial shadow, and 56 degrees in full cloud cover. These findings may assist in improving solar panel efficiency, thereby making solar panels more affordable and competitive with nonrenewable energy resources.
**Student(s):** Andrea Nicole Sajewski  
**Research Institution:** Duquesne University  
**Lead Student Home Institution:** Duquesne University  
**Lead Student Home State:** PA  
**Faculty Advisor(s):** Dr. John Andrew Viator  
**Division:** Engineering  
**Poster Title:** “Photoacoustic Flow Cytometry Using Bacteriophage for Rapid Identification of Bacterial Infection”  
**Display Area:** 43  
**Sponsoring Agency:** Duquesne University Biomedical Engineering Scholarship Fund

Abstract: When bacterial infection is suspected, a blood sample is cultured to amplify the existing bacteria for testing, requiring 48 to 72 hours before the causative agent can be identified. Until targeted antibiotics can be prescribed, the patient will take a broad-spectrum antibiotic. Still, the infection may be misidentified, as not all types of bacteria can grow within that time frame, or grow on a plate at all. Additionally, overuse of broad-spectrum antibiotics contributes to the increase in antibiotic-resistant bacteria. To address these issues, we have developed a system which makes use of bacteriophage, coupled with photoacoustic flow cytometry (PAFC), to rapidly identify bacteria in a sample of blood. This is achieved when a pulsed laser irraditates a sample passing through a flow chamber, resulting in the rapid absorption and transduction of energy by the bacteriophage, leading to the production of an acoustic wave. We use this system to detect and count bacteria in a sample of uncultured blood by using a contrasting dye to tag bacteriophage, which discriminately bind to their target bacteria. We found that free-floating bacteriophage are below the detection threshold, but when they bind to a cell, they can be detected with PAFC. For further testing, bacteriophage and host bacteria were added to blood samples which were processed through the PAFC system, demonstrating relative clinical application. Including sample preparation time, this may decrease the amount of time taken to clinically identify the infection to 2 to 3 hours, allowing doctors to immediately prescribe targeted treatment.

---

**Student(s):** Anuranita Gupta  
**Research Institution:** Drexel University College of Medicine  
**Lead Student Home Institution:** Drexel University  
**Lead Student Home State:** NJ  
**Faculty Advisor(s):** Dr. Jessica Barson  
**Division:** Biology  
**Poster Title:** “Characterization of Neuropeptides in the Thalamic Paraventricular Nucleus”  
**Display Area:** 44  
**Sponsoring Agency:** National Institute of Health, STAR Scholars Program at Drexel University  
**Grant #:** R00AA021782

Abstract: The paraventricular nucleus of the thalamus (PVT) is a brain region that has been linked to drug addiction due to its role in motivation, but its molecular composition is poorly characterized. One class of molecules that has been found in the PVT is neuropeptides, small proteins that are used by neurons for communication. Certain neuropeptides are known to affect drug use and have been found in several regions of the brain, but it is not known if they also exist in the PVT, where they could influence the motivation for drug use. We hypothesized that a subset of neuropeptides that contribute to addictive disorders could be identified in the PVT. Using the molecular biology technique of immunohistochemistry, which allows for labeling of proteins, we examined male and female rats to determine if specific neuropeptides were present in neurons of the PVT. We then used the technique of quantitative real-time polymerase chain reaction to confirm our findings by examining the levels of gene expression of each of these neuropeptides in the PVT. Our results show that the neuropeptides pituitary adenylate cyclase-activating polypeptide, neuropeptide Y, corticotropin-releasing factor, and enkephalin are present in neurons of the PVT and that the degree of their expression is similar between males and females. These results lay the groundwork for future studies to examine the contribution of these PVT neuropeptides to drug abuse, which could ultimately lead to the development of new drugs to treat addictive disorders.
**South Carolina**

**Student(s):** Kerry Wisdom Dittmeier  
**Research Institution:** Coastal Carolina University  
**Lead Student Home Institution:** Coastal Carolina University  
**Lead Student Home State:** SC  
**Faculty Advisor(s):** Dr. Sharon Thompson  
**Division:** Health Sciences  
**Poster Title:** “Bridging the Gap Between Perceptions and Reality: Perceptions of Homelessness in a Southeastern Coastal Community”  
**Display Area:** 45  
**Sponsoring Agency:** As part of a major gift to Coastal Carolina University from Kenneth E. Swain of Myrtle Beach, an endowment has been established to support a unique scholarship program for students studying health sciences.

Abstract: On any given night in the United States over 500,000 people are without a place to sleep. Horry County, located on the eastern coast of South Carolina, is ranked first and third in the state for the highest population of unsheltered homeless individuals and largest homeless population, respectively. Perceptions of homeless are important to explore because citizens may want to help, but may feel fearful of people who are homeless. Due to these alarming statistics and lack of prior research on community members’ perceptions, it was determined that there was great need to examine attitudes towards persons who are homeless. This was accomplished through a multifaceted comprehensive project that included an online survey and detailed interviews with persons who are homeless. The survey, Homelessness in Horry County, was completed by community members (n=518) to assess perceptions of factors contributing to homelessness. The main beliefs regarding causes of homelessness were found to be drug abuse (84%), insufficient income (79%) and alcohol abuse (78%). The top two groups that community members perceived should be responsible for addressing homelessness were City/Local Government (85%) and State Government (73%). Most community members (60%) agreed “people who are properly housed use fewer public services and reduce burdens on police and hospitals” and (71%) agreed “communities are safer when people aren’t living on the streets.” Initiatives that focus on the problems homeless individuals face rather than punishing associated behaviors may influence the success of programs to reduce homelessness.

**South Dakota**

**Student(s):** Joseph Mammo  
**Research Institution:** University of South Dakota  
**Lead Student Home Institution:** University of South Dakota  
**Lead Student Home State:** SD  
**Faculty Advisor(s):** Dr. Jing Liu  
**Division:** Physics/Astronomy  
**Poster Title:** “Cross-platform Data Manipulation and Visualization System”  
**Display Area:** 46  
**Sponsoring Agency:** CURCS mini-grant and National Science Foundation  
**Grant #:** 1506036

Abstract: For almost every nuclear or particle physics experiment, there exists an inherent need for the automatic controlling and monitoring of the conditions of the employed hardware components, such as high voltage supplies, temperature sensors, pressure gauges and triggering devices, etc. Such a system frees physicists from tedious tasks and reduces the change of human errors in long term operations. It is crucial in experiments searching for annual modulating dark matter signals deep underground, where yearly long stable operation is a must. We are developing such a system funded by an NSF grant (PHY-1506036), consisting of daemon programs running in computers collecting data and a web-based GUI visualizing those data in a meaningful way in monitors of various sizes. The server-client design makes it convenient to monitor and control hardware from multiple mobile devices. The daemon program is written in Python utilizing its powerful plotting libraries and its ability to call hardware driver functions written in other languages. The GUI is based on JavaScript and CSS Bootstrap to make meaningful display of data in mobile devices with various sizes possible. As a proof-of-concept, we present a complete system monitoring temperature sensors for Ge detectors developed in the radiation detector laboratory. Adding other hardware into the system is straightforward thanks to the modularized design of the Python daemon.
**Tennessee**

**Student(s):** Collin Thomas Prusak  
**Research Institution:** Milligan College  
**Lead Student Home Institution:** Milligan College  
**Lead Student Home State:** TN  
**Faculty Advisor(s):** Dr. Rebecca Launt Sapp  
**Division:** Psychology  
**Poster Title:** "The HEROES of Today Cultivate the Heroes of Tomorrow"  
**Display Area:** 47

Abstract: The big-screen heroes that represent our culture today are larger than life. However, the true heroes that depict our existence are those that serve. Our heroes are the people who work as police officers, fire-fighters, and the those fighting our nation’s wars. These heroes help make the world a safer place where children can learn and eventually become successful themselves. The HEROES program began 8 years ago as a Safe Schools/Healthy Students Initiative. It seeks to create an environment where students can foster their talents and grow. Thankfully, after the federal funding ended, the overwhelming anecdotal evidence made the program soar to greater heights. To sustain the program, we are seeking evidence-based data. This presentation addresses the hypothesis that school-based mental health services improve student success above other interventions such as academic and general student supported services. I will use data gathered by one principal detailing students’ academic performances, attendance at school, and disciplinary actions taken as outcome measures of student success. Additionally, all interventions, (Response to Intervention Programs- RTIs), were tracked including pull-out academic resources as well as student support services and school-based mental health services. This data allowed us to test our hypothesis, adding to existing practice-based evidence studies. Recent studies show RTIs are thriving in areas of behavior, equity, quality, and efficiency issues for state education agencies, school districts, and local schools. Our results will be shared and include ways to continue quality research to sustain and empower today’s students to be tomorrow’s heroes.

**Student(s):** Emma Selner  
**Research Institution:** Rhodes College  
**Lead Student Home Institution:** Rhodes College  
**Lead Student Home State:** CO  
**Faculty Advisor(s):** Dr. Mauricio Cafiero | Dr. Larryn W Peterson  
**Division:** Chemistry  
**Poster Title:** “Design of Novel Inhibitors for the Aldehyde Dehydrogenases”  
**Display Area:** 48  
**Sponsoring Agency:** National Science Foundation  
**Grant #:** 1626238

Abstract: L-DOPA is commonly used as a xenobiotic for patients with conditions such as Parkinson’s disease. LDOPA is transformed into dopamine by DOPA-decarboxylase. Dopamine derived from L-DOPA is deactivated via metabolism by a series of enzymes including Aldehyde dehydrogenases (ALDH). The targeted inhibition of the ALDH enzyme may help to prolong the effectiveness of L-DOPA, resulting in a net increase in pharmacological efficiency. By selectively designing an inhibitor for ALDH, the effectiveness of the L-DOPA can be extended by regulating the metabolism of dopamine derived from L-DOPA. The effectiveness of a series of potential inhibitors has been measured via in silico models in which the strength of interaction between each substrate and the enzymatic active site was analyzed. A crystal-structure of the ALDH enzyme with an inhibitor bound in its active site (PDB ID: 4WP7) was used to create a model of the active site. Novel dopaminergic derivatives were optimized in the active site using M062X/6-31G with implicit solvation and with relaxed amino acid side-chains. Models with two ligands in the active site were explored along with point mutations to more fully understand binding of the ligands. Interaction energies between the ligands and the protein were calculated using MO62X with the 6-311+G* basis set. Some potential inhibitors show promising results.
Texas

Student(s): Courtney May Tee  
Research Institution: Abilene Christian University at CitySquare  
Lead Student Home Institution: Abilene Christian University  
Lead Student Home State: TX  
Faculty Advisor(s): Dr. Jonathan Camp  
Division: Social Sciences  
Poster Title: “Anyone Can Change The World: An Ethnography of Design Learning in South Dallas”  
Display Area: 49

Abstract: A growing trend in education is the use of “design learning,” a project-based pedagogical style that seeks to engage the learner encourage creativity, and empower students to apply their learning in real-world contexts. This type of education has seen success around the world and has been suggested as a tool for education reform, but more formal research is needed on this process and its outcomes. This study sought to contribute to our understanding by examining the implementation of a design learning curriculum in a Dallas ISD elementary school that is classified as Title I, where there is an urgent need to understand how to deliver better education outcomes to underserved students. The study was qualitative in nature and was structured as an ethnography in order to gain a deep understanding of how the curriculum interacted with and influenced the students. Over the course of one full school year, the researcher observed and participated in the classroom, collecting qualitative data in the form of field notes and student interviews. It was demonstrated that the students in the study flourished with a design learning curriculum, showing increased engagement, agency, and empowerment in the classroom. We hypothesize that this positive outcome was achieved because design learning encourages students to apply their education to solve problems around them, contextualizing their learning and legitimizing their knowledge and skills. Implications of these findings are discussed to suggest how our education system might be shaped to educate and empower all students for a changing, challenging world.

Student(s): Evelyn Villarreal  
Research Institution: University of Texas at El Paso  
Lead Student Home Institution: University of Texas at El Paso  
Lead Student Home State: TX  
Faculty Advisor(s): Dr. Laura A Diaz-Martinez | Dr. Celia Pechak  
Division: Engineering  
Poster Title: “Preparing Doctor of Physical Therapy Students to Better Serve a Hispanic Majority Community by Integrating Spanish Language Training”  
Display Area: 50

Abstract: Spanish is the most commonly spoken language in the United States after English. Spanish-speaking individuals who do not speak and understand English well (i.e., demonstrate limited English proficiency) have immigrated across the United States. They often have poor access to health care and negative health outcomes because of the language barrier. To address health inequity, the US Office of Minority Health developed the National Standards for Culturally and Linguistically Appropriate Services in Health and Health Care. Congruent with the aims of these standards, the University of Texas at El Paso (UTEP) Doctor of Physical Therapy (DPT) Program has integrated Spanish training across its curriculum. The purpose of this study was to evaluate the effects of this training on students. First-year students were enrolled in an 8-week Spanish medical terminology course and practiced Spanish in subsequent semesters during laboratory and service-learning experiences. The students completed pre-tests in the first semester and post-tests in their fifth semester on self-ratings of their ability to speak, understand, read, and write Spanish; a written Spanish vocabulary test; and a questionnaire about their beliefs and attitudes about Spanish language training. This study supports that the Spanish language training model improved self-ratings of Spanish proficiency and increased Spanish vocabulary. Results also suggest that students recognize personal and professional benefits from learning Spanish. Future research is needed to evaluate if students’ communication is effective with Spanish-speaking individuals in clinical settings. This research is one step toward developing effective educational models that address health disparities caused by language barriers.
Abstract: Shigella flexneri is a bacterial pathogen that causes shigellosis, a severe form of dysentery hallmarked by massive fluid loss and hemorrhaging of the intestines. Though treatable with certain antibiotics, shigellosis presents a worldwide health concern with an estimated 90 million infections and greater than 100,000 deaths annually. Shigella relies on a specialized transport system, called the type three secretion system (T3SS), to directly inject bacterial proteins into human host cells and cause infection. The complex protein machinery of the T3SS is highly conserved among related bacteria including Salmonella (food poisoning), Pseudomonas (lung infections), and Yersinia (plague). The apparatus includes a hollow needle-like structure through which specialized effector proteins are secreted and a sorting platform that resides at the base. We have recently characterized the Shigella sorting platform protein, Spa47, as an ATPase which likely provides the necessary energy for the formation of the T3SS needle and subsequent secretion of bacterial proteins into host cells. In the work presented here, we solved several high-resolution crystal structures of Spa47 which we use to model an activated Spa47 complex and guide the design of key Spa47 mutations, providing the first insight into both the structure and function of what we believe represents the “powerhouse protein” supporting Shigella infection. These findings add to our understanding of how an important class of bacteria cause infection and provide a strong platform for follow-up studies evaluating the regulation of Spa47 oligomerization in vivo as a much needed means of treating and potentially preventing shigellosis and related diseases.

Student(s): Jenna M. Bouvang
Research Institution: Utah State University
Lead Student Home Institution: Utah State University
Lead Student Home State: UT
Faculty Advisor(s): Dr. Nicholas E. Dickenson
Division: Chemistry
Poster Title: “Structural and Functional Characterization of the Shigella flexneri Type Three Secretion System (T3SS) ATPase Spa47”
Display Area: 51
Sponsoring Agency: National Institutes of Health, USU Office of Research and Graduate Studies
Grant #: 1K22AI099086-01A1

Abstract: In this part oral history, part historical research paper, I explore the life of Peggy Citarella who, at the age of 21, began her career as the first woman welder during WWII. The extenuating circumstances of the war opened up opportunities for women like never before but it was Peggy’s tenacious attitude that allowed her to break the gender barrier in welding. With the advent of WWII, Peggy pursued a welding program at a local trade school where she received her certification and became an instructor, putting over a hundred men through the welding program during the war. Soon after, Peggy applied for a job at the Charlestown Navy Yard. After going above and beyond the requirements in her welding test for the job application, she was hired immediately. Alone in the man’s world of welding, she was a point of curiosity as well as discrimination. Some of the men welcomed her and nurtured her welding skills. Others saw her as a threat and doubted her abilities. However, she persevered and excelled at welding, working her way up to the highest rank attainable at the yard. Her skill and dedication didn’t go unnoticed and was lauded for her efforts being placed among the best welders in the Navy Yard. Her efforts over 70 years ago represent the legitimacy of women’s capabilities in the workforce and she is one out of the many that made the war effort possible and who played a vital role in bringing the war to a successful end.

Student(s): Julia Christine Wagner
Research Institution: Saint Michael's College
Lead Student Home Institution: Saint Michael's College
Lead Student Home State: VT
Faculty Advisor(s): Dr. Susan Ouellette
Division: Arts and Humanities
Poster Title: “Not Ordinary and Not Nice: The First Female Welder at the Charlestown Navy Yard during WWII”
Display Area: 53
Sponsoring Agency: Funding from the Vice President’s Association
 council on undergraduate research

36

Student(s): Perri Silverhart
Research Institution: Middlebury College
Lead Student Home Institution: Middlebury College
Lead Student Home State: CT
Faculty Advisor(s): Dr. Patricia Lee Manley | Dr. Thomas Manley
Division: Geosciences
Poster Title: “Utilizing Landslides in Lake Champlain as Paleoseismic and Paleohazard Indicators”
Display Area: 54
Sponsoring Agency: Middlebury College Senior Research Fund, Lake Champlain Research Consortium, and Lintilhac Foundation

Abstract: Lacustrine landslides have been identified in Lake Champlain via Multibeam and CHIRP (compressed high-intensity radar pulse) seismic profile imagery. Previous studies show that several of these landslides are coeval occurring ~4500 – 5500 cal yr BP. This study focuses on a series of four overlapping landslide deposits on the western side of the main section of Lake Champlain between Bouquet River Delta and Essex, NY, where nearly the entire slope has failed with the exception of a few locations where intact blocks of slope sediment remain. Utilizing radionuclide dating on sediment from the unfailed slopes, sedimentation rates were determined and used to calculate the approximate failure ages for each of the four landslides studied. The northernmost failure occurred about 950-1200 cal yr BP and is the first mass wasting event of this age to be recorded on Lake Champlain. The remaining regions failed about 4500-5200 cal yr BP, and agree with the previously studied landslides within Lake Champlain. In the nearby Western Quebec Seismic Zone (WQSZ), clusters of terrestrial landslides have occurred at 1000 and 5000 cal yr BP and are triggered by large earthquakes. The 5000 cal yr BP event has been attributed to a M 6.4 or greater earthquake within the WQSZ. The landslides observed in Lake Champlain are likely triggered by this same earthquake. Additionally, lake tsunami models show that these simultaneous landslide failures can generate a surface water wave of 30 feet that can impact the shoreline within 3-10 minutes after the earthquake.

Virginia

Student(s): Sydney Brown
Research Institution: Virginia Commonwealth University
Lead Student Home Institution: Virginia Commonwealth University
Lead Student Home State: VA
Faculty Advisor(s): Dr. Kim Isringhausen
Division: Social Sciences
Poster Title: “Global Use of Allied Dental Providers in Addressing Access and Equity”
Display Area: 52

Abstract: According to the Commonwealth Fund’s report, “Mirror, Mirror on the Wall — 2014 Update,” The United States health care system under performs relative to other industrialized countries on most dimensions of performance including access, and equity. Today, over 45 million adults and children live in dental shortage areas in the United States. Traditionally, low-income populations, individuals eligible for Medicaid benefits, and rural communities suffer disproportionately from oral disease due to inadequate access to affordable oral health care. Access to dental care is a global issue that has been tackled by many different countries in a variety of different ways for centuries. In other countries, mid-level providers, like dental therapists, are seen as a part of the solution. A mid-level provider could be a means of increasing access to dental care and reducing the current problems associated with accessing dental care in the United States. However, in the United States there is controversy surrounding the use of mid-level providers due to the lack of understanding of the historical efforts of mid-level providers internationally. The objective of the this work is to: (1) critically assess the health care systems of Australia, New Zealand, the United Kingdom, Canada, and the Netherlands, focusing on access and equity measures in the provision of dental care; (2) determine if the use of mid-level providers has contributed to high measures of access and equity; and (3) use findings for improvement of access and equity of the United States dental delivery system.
Abstract: From blood vessels to the small intestine to the spinal cord, tubes are an essential part of nearly all multi-cellular organisms. Errors in tube formation cause many of the birth defects that afflict infants, including congenital heart defects and spina bifida, a failure to close the neural tube. Our lab uses the fruit fly Drosophila melanogaster to study tube formation because of the highly conserved nature of this morphological process between our species. My project focuses specifically on a family of genes called Imaginal Disc Growth Factors (IDGFs) which are linked to tubulogenesis in Drosophila and are closely related to a human protein family (CLPs) that have been found to be dysregulated in numerous diseases including arthritis and in metastasizing tumor cells. While this homology indicates that IDGFs have a role in cell patterning, the mechanisms by which these genes act remain unclear. Last year, I used CRISPR/Cas9, a powerful method for excising genes, to investigate the function of one IDGF, the gene Idgf6, by deleting it entirely. Analysis of these knock-out mutants suggests that Idgf6 plays an important role in making and shaping tubes and that removal of Idgf6 results in branched structures instead of discrete tubes. This branching phenotype likely limits the flow of oxygen to the developing embryo, resulting in decreased survival of offspring. My current research explores this genetic pathway further by using antibody staining to determine the mechanism of tube dysfunction in Idgf6 mutants and to identify other pathways that interact with Idgf6 during tubulogenesis.

Abstract: Petroleum is the primary fuel feedstock for the transportation industry and a quickly vanishing resource. Experts believe we will reach peak oil production within three generations; in combination with rising prices and political instability in fuel-producing regions, the need for an alternative feedstock is both economically and politically apparent. Additionally, the Pentagon has listed climate change as a global security threat, increasing the need to curb greenhouse gas emissions immediately. Microalgae are photosynthetic organisms that are energy dense and grow quickly without expensive fertilizers, fresh water, or arable land. Research shows microalgae that can attain 70% oil by dry biomass could satisfy as much as 50% of the United States’ transport fuel needs while using less than 2% of the 13.9 million acres used for corn-based ethanol production, without adding extra CO2 to the atmosphere. In an effort to optimize Chlorella vulgaris, a unicellular green microalgae, to have a percent oil by biomass closer to 70%, we attempted to use natural selection by exposing it to a herbicide that disables an enzyme essential for lipid (oil) synthesis. While our intention was to select for the algae with a large accumulation of the enzyme, serendipitously the results showed over 3X the lipid percent of the control after one herbicide dosage. Experiments are ongoing to characterize the mechanism of lipid accumulation under these circumstances. Since our results were consistently higher than the published maximum lipid percent for this alga, uncovering the mechanism could help engineer C. vulgaris for large-scale biofuel production.
**Student(s):** Sundus Sakeena Lateef  
**Research Institution:** West Virginia University  
**Lead Student Home Institution:** West Virginia University  
**Lead Student Home State:** WV  
**Faculty Advisor(s):** Dr. Janet Tou | Dr. Vagner Benedito  
**Division:** Health Sciences  
**Poster Title:** “High Fructose Corn Syrup-55 Promotes Triglyceride Accumulation and Alters Fat Metabolism in the Liver”  
**Display Area:** 60  
**Sponsoring Agency:** West Virginia University PSCOR and Agricultural, Forestry Experimental Station Hatch Grant H45, and Summer Undergraduate Research Education program

Abstract: High fructose intake promotes metabolic dysfunction, particularly de novo lipogenesis (DNL), a condition in which increased lipid (fat) synthesis is not compensated by increased lipid breakdown. DNL promotes non-alcoholic fatty liver disease (NAFLD). NAFLD often progresses to cirrhosis and liver failure and affects more than 28 million adults in the United States. High fructose corn syrup-55 has replaced sucrose (table sugar) as a caloric sweetener in various processed foods. This study investigated whether the slightly higher fructose content in high fructose corn syrup-55 (HFCS-55; 55% free fructose) is more lipogenic than sucrose (50% fructose in disaccharide form). Healthy growing rats were assigned to one of four treatment groups consisting of either 1) water or water sweetened with 2) sucrose, 3) fructose or 4) HFCS-55 for 8 weeks. Caloric sweeteners were administered at a concentration of 13% weight/volume, the level typically found in sugar-sweetened beverages. There was no significant difference in caloric intake between rats drinking HFCS-55 and sucrose-sweetened beverages. Rats drinking HFCS-55 had the most extensive evidence of fatty deposits in the liver of any treatment group. Molecular genetic analysis of liver tissues showed enzymes activating DNL were higher and liver lipid output was lower in the HFCS-55 treatment group compared to the sucrose group. Blood triglyceride and low-density lipoprotein levels were higher in rats drinking HFCS-55 compared to water but not in sucrose versus water. The study results indicate that healthy growing rats were at a greater risk of developing NAFLD due to HFCS-55 consumption compared to sucrose consumption.

---

**Wisconsin**

**Student(s):** Alexis C. Econie  
**Research Institution:** University of Wisconsin-Stout  
**Lead Student Home Institution:** Illinois State University  
**Lead Student Home State:** IL  
**Faculty Advisor(s):** Dr. Nels Paulson  
**Division:** Social Sciences  
**Poster Title:** “Power in Connectivity: Social Capital and BMP Lease Agreements”  
**Display Area:** 56  
**Sponsoring Agency:** The National Science Foundation

Abstract: Drawing inspiration from national-level resource conservation conflicts, this examination of the phosphorus pollution problem in west-central Wisconsin focuses acutely on the social interactions that inform landowner decisions about sustainability aspects of agricultural lease agreements, thus influencing the overall health of contiguous watersheds. Following from a National Science Foundation Research Experience for Undergraduates, this project seeks to critically evaluate the impacts of social integration and civic engagement on the adoption of sustainability practices in agricultural lease agreements. As knowledge transfer around agricultural conservation and best management practices are commonly advanced by interpersonal interactions, we specifically investigated the relationships between Non-Operating Landowners and their farming tenants. Data were collected via survey methodology and analyzed using multivariate regression; semi-structured interviews and focus groups were conducted to provide supplementary qualitative data. Our findings suggest that Non-Operating Landowners who are connected to other Non-Operating Landowners through civic engagement in local groups and organizations place a higher value on conservation of their land and are more likely to include best management practices in their leases. Additionally, Non-Operating Landowners who have closer relationships with their tenants are more likely to require best management practices in their lease agreements. These findings demonstrate the utility of social capital in knowledge transfer and illustrate the value of erecting programs aimed at decreasing Non-Operating Landowner isolation to promote greater civic engagement, as well as constructing policies focused on mitigating agriculture-based natural resource conflicts.
**Student(s):** Rebecca Tolfa  
**Research Institution:** University of Wisconsin-Oshkosh  
**Lead Student Home Institution:** University of Wisconsin-Oshkosh  
**Lead Student Home State:** WI  
**Faculty Advisor(s):** Dr. Ashley E Thompson  
**Division:** Psychology  
**Poster Title:** “Underrepresented but Overexposed: Differences in Experiences with Discriminatory Behavior and Sexual Assault on Campus between Gender Minority and Cisgender Students”  
**Display Area:** 57

Abstract: Despite advancements in the rights and acceptance of LGBTQ+ individuals in society, university climate for these students remains hostile and often not conducive to academic success (Jackson et al., 2016). These students often report high rates of experience with discriminatory behavior and sexual assault (Woodford et al., 2015). However, no research has examined these experiences among gender minority students specifically (e.g., transgender, nonbinary gender). Thus, the current study compared experiences with discriminatory behavior and sexual assault among 1831 cisgender and gender minority students attending a mid-sized American public university. Overall, gender minority students (M = 4.41, SD = 4.99) experienced significantly greater discriminatory behaviors than did cisgender men (M = 0.67, SD = 2.01) and women (M = 0.92, SD = 2.28), F(2, 1828) = 45.64, p < .001. Gender minority students also reported a significantly higher percentage of being a victim of sexual assault (13.9%) than did cisgender men (2.1%) and cisgender women (5.4%), Chi-Square(2, N = 1831) = 15.84, p < .001. Despite their experiences, gender minority students did not report discriminatory behaviors or sexual assault to community or university authorities to a greater extent than did their cisgender counterparts. Further examination revealed that gender minority students experienced a wide-range of discriminatory behaviors and that other students were the most common perpetrator. This work has implications for campuses working to promote equity and for policymakers working to improve on-campus reporting procedures to ensure that gender minority students’ voices are valued and heard.

---

**Student(s):** Samantha Bartnik | Adam Wiest | Carly Mueller  
**Research Institution:** University of Wisconsin-Eau Claire  
**Lead Student Home Institution:** University of Wisconsin-Eau Claire  
**Lead Student Home State:** WI  
**Faculty Advisor(s):** Dr. J. Brian Mahoney  
**Division:** Geosciences  
**Poster Title:** “Establishing an Environmental Baseline for Surface and Groundwater Chemistry in Western Wisconsin: Key to Developing Reasonable and Responsible Regulations”  
**Display Area:** 58

Abstract: The high demand for silica sand by the petroleum industry has led to a dramatic expansion of silica sand mining in western Wisconsin. That has generated immense public concern about the potential environmental impact to surface water and groundwater. The Wisconsin Department of Natural Resources has proposed water quality regulations on silica sand operations that the industry considers onerous. Documentation of the natural concentration and mobility of trace elements in the environment is a critical first step in the development of environmental safeguards. This investigation will establish a comprehensive environmental baseline documenting background variations of ~25 trace metals in natural waters throughout the region. This study will constrain the concentration and mobility of trace metals that occur naturally in geologic formations. Chemical analysis of ~70 surface water, 50 municipal groundwater, and 50 whole rock, mine tailings, and wasterock storage pile samples will constrain the relationship between the bedrock trace metal content and the composition of natural waters. Preliminary results suggest limited trace metal mobility between geologic formations and surface water and groundwater, and trace metal values (e.g., arsenic, lead, cadmium, zinc) are well below federal drinking water standards. Integrating these data with site-specific analyses of surface water and groundwater at mine sites will permit quantification of potential contaminants generated during the mine process. These data are vital to the development of reasonable and responsible environmental safeguards that will facilitate economic growth and sustainable development of the silica sand industry, while safeguarding water resources and public health in western Wisconsin.
HAVE YOU REGISTERED YET?
CUR UPCOMING EVENTS FOR FACULTY AND STUDENTS

Student Based:

Research Experiences for Undergraduate Symposium (REUS)
October 2017 – Location TBD – Application deadline: Summer 2017

National Conference on Undergraduate Research (NCUR)
University of Central Oklahoma
April 4-7, 2018 (Applications accepted each fall)

Posters on the Hill (POH)
Dates: April 2018 – Washington, DC
Applications accepted each fall

Faculty Based:

Undergraduate Research Program Director’s (URPD) Meeting
June 27-29, 2017, Northern Arizona University, Flagstaff
Registration closes May 31, 2017

Proposal Writing Institute (PWI)
July 13-16, 2017, Moorhead, MN
Application Deadline: May 22, 2017

Creative Inquiry in the Arts and Humanities Institute (A&H)
November 10-12, 2017, The Lincoln University, PA
Application Deadline: September 25, 2017

Beginning a Research Program in the Natural Sciences at a Predominately Undergraduate Institution Institute (BRP)
Fall 2017 (typically November)

Initiating and Sustaining Undergraduate Research Programs (ISURP)
January 19-21, 2018, University of Central Florida

CUR Dialogues
February 15-17, 2018 – Hyatt Regency Crystal City, Arlington, VA
Registration open in Fall 2017

CUR Biennial Conference
June 30-July 1, 2018, Hyatt Regency Crystal City, Arlington, VA
Registration: April 2018 (Early Bird), May 2018 (Last day)

Interested in more information about our events? Please see our website at www.cur.org for more information!