

Student Research Poster Display

Caputo Hall Lobby

October 17-23, 2018

Applied Engineering, Safety and Technology

Biology

Chemistry

Earth Sciences

Mathematics

Physics

College of Science and Technology



Millersville University

COLLEGE OF SCIENCE
AND TECHNOLOGY

Welcome Message from the Dean

On behalf of everyone in the College of Science and Technology, welcome to the 18th Annual Fall Student Research Poster Display. In your program, you will find four select abstracts of student/faculty research that are representative of the excellent and innovative work being done within the College.

Student/faculty research has a rich history at Millersville University with the goals of this event being to

- celebrate the breadth of research inquiry and scholarly activity within the College,
- promote and create a sense of excitement about the research students and faculty are collaboratively engaging in, and
- recognize the hard work and dedication of our students and faculty.

Engaging undergraduates in research is critical to a student's development as a scholar and innovator as well as a key feature in Millersville University's strategic plan, *Our Bold Path*. Identified as a high-impact practice, research experiences place the content knowledge students learn in the classroom into the context for how it is used within the discipline and by practitioners in the field. I would like to thank Dr. Aaron Haines, Ms. Marianne Frantz, and Ms. Lynnea Holler for organizing the event.

I hope you enjoy perusing the poster displays and the fine work performed by our students and faculty.

Sincerely,


 Michael Jackson
Dean, College of Science and Technology

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Abstract Number

An asterisk (*) denotes the SCTE faculty mentor for the student research

Earth Sciences

4. Cross-Frontal Exchange of Water Masses Across the New England Shelf Break Front Observed Using the Coastal Pioneer Array

Authors: Cassandra Alexander, Nathan N. Murry, and Robert D. Vaillancourt*

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Intrusions of warmer, saltier continental slope and Gulf Stream warm core ring (WCR) water onto the New England continental shelf are becoming more frequent during the last several years (Gawarkiewicz et al., 2018), and may in the future world cause significant changes to the biological productivity and physical dynamics of the shelf seas. This undergraduate research poster reports preliminary observations and analyses of a Gulf Stream WCR intrusion onto the shelf during the late spring and early summer of 2014 (first reported by Zhang & Gawarkiewicz, 2015) using the Ocean Observatory Initiative's Pioneer Array. This event appeared as an abrupt warming from ca. 15° C to ca. 25°C, accompanied by an abrupt increase in absolute salinity from ca. 35 to ca. 36.5. The intrusion of the S = 36.0 isohaline extended near 200 m depth and was accompanied by sudden decreases in CDOM and *in-vivo* chlorophyll *a* fluorescence, indicating oligotrophy. Very similar timing of water mass changes were observed at the two outer shelf profiling moorings, G and J, situated 9 km apart. Cross-correlation analysis of salinity at mooring J and G indicated a time lag of approximately 2 days, for an estimated average alongshelf current velocity for this meander of 0.04 ms⁻¹, similar in magnitude to current velocities estimated by geostrophic calculations.

*faculty mentor

Chemistry

1. Inverse Electron Demand Diels-Alder Studies on Substituted Imines

Good, Gillian; Laughlin, Rachel; Kennedy, Steven M.*
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Nitrogen and oxygen containing heterocycles including benzopyrans are becoming increasingly relevant due to their wide variety of biological applications. 4-Aminobenzopyrans and their derivatives are of particular interest as they interact with potassium channels, making them valuable anti-hypertensive and anti-ischemic drugs. While there are a wide variety of viable synthesis strategies for preparing these molecules including use of LiBF₄ and Bi(OTf)₃ catalysts, it is our goal to produce more facile techniques. A recent study by Kumar *et al.* reports a one pot inverse electron demand Diels-Alder synthesis of fused pyranobenzopyrans and furanobenzopyrans using salicylaldehyde, aromatic amines, and 2,3-dihydrofuran catalyzed with cellulose sulfuric acid. Our long-term goal is to expand the scope of this reaction by utilizing various substituted imines previously synthesized in our lab. In addition, we hope to experiment with various oxygen and nitrogen containing dienophiles to increase the molecular diversity of our library of derivatives.

*faculty mentor

Chemistry

2. Catalytic Activity of Au and Ni nanocatalysts in the reduction of 4-nitrophenol and nitroanilines with NaBH₄

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Noble metals such as gold (Au), platinum (Pt), and palladium (Pd) are excellent but expensive catalysts for a wide variety of reactions. Mixed metal nanostructures that consist of noble metals and less expensive metals such as nickel (Ni) may show catalytic activity comparable to that of the noble metal catalysts, but with the advantages of reduced cost. We investigated the catalytic activity of Au and Ni nanocatalysts in the reduction of 2-nitroaniline, 3-nitroaniline, 4-nitroaniline, and 4-nitrophenol (PNP) with NaBH₄. Reduction of aromatic nitro groups to amines is an important reaction in the synthesis of many pharmaceuticals, polymers and agricultural chemicals. Both Au and Ni catalyzed the reduction each nitro compound except 3-nitroaniline. Au was the better catalyst. The easiest compound to reduce with either Au or Ni as catalyst was PNP, followed by 4 nitroaniline, then 2 nitroaniline. The compound that showed the greatest difference between the rate of reduction catalyzed by Au compared to reduction catalyzed by Ni was 2-nitroaniline.

* faculty mentor

Computer Science

3. Converting Grasst to BASH

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In Spring of 2018, we upgraded and ported an automated grading system known as *grasst*. This grading system was built in the 90s and remains in use at the Computer Science department at Millersville for many lower level courses. This system was originally written in *csh*, with certain components written in C++. We ported the grader parts to Bash, to enable new features like structured programming and the use of shell functions. Bash also enabled automatic completion of certain user actions in the grading script. Updating these old scripts and making modifications brought to light many of the challenges of software maintenance. We used creative solutions for maintaining compatibility with existing configuration files. For example, we redefined *setenv*, the operation that sets environment variables in *csh*, to be a function in bash that accomplishes the task, allowing us to source the original *csh* formatted file. We also used functions to replace complex aliases. One obvious lesson is the importance of languages that support structured programming with functions. Since *csh* lacked functions, the original code was less modular and readable than it would have been with functions.

* faculty mentor