Undergraduate Research Highlights
2012-2013
Undergraduate Research Highlights

Above, left to right: **Tucker Wright** (undergraduate Chemistry student), **Frank Rossi** (Associate Professor, Chemistry) and **Tyler Potter** (undergraduate Chemistry student) presenting at the Annual Meeting of the American Chemical Society (New Orleans, LA).

Cover: Assistant Professor of Chemistry, **Dr. Jeffry Werner** (left) and research students **John Chodkowskii** (Chemistry) and **Margaret Murphy** (Chemistry and Physics Adolescence Education).
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GET YOUR hands on RESEARCH
A year in undergraduate research

The 2012-13 academic year has been tremendously successful both in terms of the quality of undergraduate research performed on this campus and the growth in the College’s programs supporting and fostering participation in undergraduate research by students and faculty mentors alike.

This past year, SUNY Cortland saw an increase in collaborative research projects between undergraduate students and faculty mentors within its curricular offerings and outside of the classroom. Not only are our students doing more and better research, but more of them are presenting their research at regional and national conferences – we have even seen an increase in the number of Cortland student authors publishing their scholarly work in peer-reviewed academic journals.

Other initiatives this past year have born fruit. The 2012-13 academic year saw the launch of the Undergraduate Research Assistant Program (URAP). This partnership with the College’s Financial Aid Office allows the URAP program to award faculty with research assistants drawn from the pool of work-study eligible undergraduate students. Also this year, the URC, working with the College’s Presidential Leadership Coalition on Student Engagement, started a new program to recognize the outstanding scholarly achievements of SUNY Cortland students. The College created the President’s Recognition for Engaged Learning and Leadership Designation in Undergraduate Research to provide formal institutional recognition of an undergraduate student’s high-level achievements and participation in independent research or creative activities.

As in past Highlights, a majority of this booklet focuses on the College’s Undergraduate Summer Research Fellowship program. The student researchers featured in this report have distinguished themselves by their active involvement in research at the undergraduate level.

Sustaining the growth in SUNY Cortland’s undergraduate research program remains an important goal of the institution with direct impact on student learning, recruitment, and retention. With this in mind, the Undergraduate Research Council looks forward to the next year.

Christopher McRoberts
Director, Undergraduate Research Council
Alexandra Abbott
Archaeology

How archaeological discoveries are influencing and guiding the revitalization of traditional ceramic practices in western Belize

“I’ve dreamed of becoming an archaeologist since I was in 5th grade, and this is only my first step towards making it happen”

Alexandra’s research involves the collaboration of Mayan archaeology and Mayan ceramics. Three weeks of her research took place in Belize where Alexandra participated in an archaeological field school working at Mayan ruin, Cahal Pech. This included field work in addition to work in the lab with many ceramics pieces and other artifacts found throughout the site. For the remainder of her time in Belize, Alexandra lived with a Mayan family in the small, rural town of San Antonio. While living the traditional Mayan family lifestyle, she also was working hands-on with clay that was dug from the ground near the Guatemalan border. This offered her an opportunity to work seriously towards making the connection among archaeology and ceramics. Learning traditional art forms aided Alexandra in making this remarkable collaboration between Mayan archaeology and Mayan ceramics. As she continues her research, Alexandra also hopes to aid the Mayan culture expand their ancestral ways to others around the country.

Faculty Mentor
Jeremiah Donovan, Professor
Art and Art History

“This experience has allowed Alexandra the opportunity to work alongside selected students and preeminent archeologists from around the world.”
Kelsey Bordwell
Physical Education

Sensory integration motor sensory (SIMS) center activity guide for children with sensory processing disorders (SPD)

“My research project has provided me with an opportunity to gain insight on helping young students with Sensory Processing Disorders. Learning how their environment affects their learning I can further more help children with SPD succeed and reach their potential. “

Kelsey’s research involved comparing the different behaviors in children with sensory processing disorders when in a traditional gymnasium versus an environment with controlled and directed activities in SUNY Cortland’s Sensory Integration Motor Sensory Center. Her research investigates the question: Is there really a difference in how the child behaves when in these two different settings? She is investigating the noncompliant behaviors while administering the lessons in the two different environments. Her research will be the basis for an activity guide that can be used to enhance physical education majors understanding of sensory processing disorders and associated activities used to address the motor needs of children with this diagnosis.

Faculty Mentor
Timothy Davis, Associate Professor, Physical Education

“Kelsey’s project provides examples of what general PE teachers can do to explore their own teaching environments and the impact it may have on learning. Her work is a great example of applied research skills that contributes to addressing a child’s specific needs.”
A critical discourse analysis of “No Promo Homo” policies in the United States

“Being able to work on my fellowship has helped me achieve a dream of conducting real investigative research on social discrimination”

Arron’s project critically investigated policies that potentially deny lesbian, gay, bisexual or transgender (LGBT) students a chance to feel included at school. LGBT students experience higher suicide rates and aggregate levels of school-based victimization. However, several states and school districts have implemented what have been labeled “no promo homo” (NPH) policies mandating a “neutral” position on homosexuality and prohibiting any school based instruction or activity that could be interpreted as promoting homosexuality. Arron conducted a critical discourse analysis of NPH policies to explore the relationship between language, policy, and society. Specifically, he employed a problem-oriented approach to examine how NPH policies position teachers, school staff, and both LGBT students and their classmates as victims of and responders to bullying on the basis of sexual orientation.

Faculty Mentor
Brian Barrett, Associate Professor, Foundations and Social Advocacy

“It has been rewarding to watch Arron position himself for future success at the graduate level by making such an early and impressive contribution to the field of educational research...”
The effects of both planar and coplanar congeners on voluntary ethanol intake in rats

“My fellowship has been a truly amazing experience and working with Dr. Berger has helped me to expand my understanding of how real research is conducted in the behavioral sciences and gain important skills that will be beneficial for my future career as a neuroscientist”

Poly-chlorinated biphenyls (PCBs) are toxic environmental contaminants. They are found throughout the world in soil and water. Renee’s research involves studying the effects of two different PCBs on voluntary alcohol intake by adolescent female rats. Renee’s investigation uses one PCB that fits estrogen receptors in the body, causing the rats to crave alcohol, while the other blocks estrogen receptors, resulting in less craving. The procedure involves feeding the rats either PCB-containing or control cookies every day for 30 days. After the 30 day dosing period, the rats are allowed 24-hour access to alcohol for 20 days, and are then allowed to consume alcohol for only one hour per day for the next 12 days. The latter serves as an animal model of addictive behavior.

Faculty Mentor
David Berger, Professor, Psychology

The importance of Renee’s research involves its implications for the relatively higher vulnerability to alcohol addiction by females, compared to males. This is a major concern voiced today on college campuses.
Adam Graham
Chemistry

A bioinformatics analysis of the information content of all tryptic peptides in the known universe

“I find this project exceptionally relevant and fascinating. As a non-traditional student with a ten year background in Information Technology and a focus in Chemistry, this is a merging of my past and future lives.”

Adam’s project centers around matching tryptic peptides obtained from known protein sequences to the organisms they come from and the functions they performed. Some of the most complicated and least understood ecosystems on earth are those consisting of the thousands of different microbial species in a single handful of soil. Microbial communities perform essential functions for life on earth. In order to analyze proteins, they must first be broken up into small fragments, or “tryptic peptides.” Adam has been writing scripts in the PERL programming language to parse large databases of over 14 million unique protein sequences and over 300 million unique tryptic peptides. By analyzing and comparing the data, Adam is looking to benchmark the information content of tryptic peptides, to enable researchers to more easily design experiments looking at environmental proteins.

Faculty Mentor
Jeffrey Werner, Assistant Professor, Chemistry

“Working with Adam has been a great collaboration. He has taken his background in computer programming and applied it to some really interesting bioinformatics questions.”
The last step to a green end-product from microbiologically-produced carbon chains

Joe’s research involves experimenting to find the most efficient method to make and purify hexanoic acid as a commercial product from a bioreactor output. His research is part of a larger collaboration with researchers at Cornell University to make green commodity chemicals from biomass such as urban waste or agricultural products. During his summer research term, Joe has spent a lot of time working with modifying conditions systematically to change the solubility and partitioning of hexanoic acid, in order to favor efficient product recovery. Joe and his advisor Jeff Werner hope that these results will aid in the development of processes for green carbon-neutral production of fuel and bulk chemicals.

Faculty Mentor
Jeffrey Werner, Assistant Professor, Chemistry

“Joe’s research has provided us with some crucial data needed to do an economic and energy-balance analysis of products that could be made from our bioreactor system that we’ve been collaborating to develop with researchers at Cornell University.”

“Working as a Summer Research Fellow has been a great experience. Not only have I learned new techniques and procedures but it has helped me become a more independent scientist and researcher.”

Joe Hetzler
Chemistry
Michael Myones
Political Science

The suppression of the vote: American democracy at risk?

“This opportunity has greatly tested my research capabilities in a field that is a current and evolving area of law, as well as shaped my skills for future endeavors in political science.”

Michael’s research involves an investigation and analysis of the recent effort to suppress the vote throughout the United States. Mike is focusing specifically on efforts by Republican-led legislatures to put in places obstacles for voters who tend to support Democratic candidates. These attempts often disenfranchise significant numbers of voters, including minorities, the elderly, and young voters. Mike is surveying identification requirements to vote, partisan gerrymandering of legislative districts, ending of early voting, and the potential implications of each of these efforts on the American voting population. As well, he researched the connection between such voter suppression efforts and the recent Court rulings involving voting rights. Research in this area of election law is still at its earliest stages which gave Michael a chance to work in a completely new environment.

Faculty Mentor
Henry Steck, Professor, Political Science

“Mike is undertaking a significant topic – namely, the widespread efforts to suppress the vote and the intense political and legal battles that are underway as a result. His research is of urgent importance to understanding the threat to our democratic politics.”
Gregory Simone  
Chemistry

Atmospheric carbon dioxide in Cortland County, NY

“Environmental change and its effect on the Earth have always been an interest of mine and doing research with Dr. Jeffers has taught me so much and will benefit me in my future academic life and my future in graduate school.

Greg’s research involves measuring atmospheric CO\textsubscript{2} concentrations from a variety of locations across Cortland County. As part of the research, Greg and faculty mentor Dr. Jeffers have designed and built a hand-blown vacuum glass apparatus to measure CO\textsubscript{2} concentrations in air samples. They are comparing their atmospheric CO\textsubscript{2} values collected from forest, agricultural, city and industrial sites at different times of the day with data collected by the National Oceanographic and Atmospheric Administration. Their data are statistically analyzed to determine differences due to localized environmental factors. Greg’s research addresses questions surrounding increasing amounts of carbon in the atmosphere due to the burning of fossil fuels and what effect localized atmospheric concentrations may play in transient CO\textsubscript{2} concentrations.

Faculty Mentor  
Peter Jeffers, Professor Emeritus, Chemistry

“Gregory has become adept at taking meaningful air samples, analyzing them for carbon dioxide concentration, and suggesting reasonable explanations for results that appear outside the expected results. I’m delighted to observe how a research experience opens a student’s eyes to the actual process and true meaning of science.”
Imani Sinclair
Biomedical Sciences

**Improved stability of a cell-based biosensor for detection of chemicals in drinking water**

“My research experience this summer was amazing. It has enabled me to gain new laboratory skills and also solidified my decision to go into medical research.”

Live mammalian cells can be used as biosensors to detect harmful chemicals in drinking water. However, live cells are hard to maintain outside of a lab environment. Imani’s research involves stabilizing mammalian cells for field use. In collaboration with Luna Innovations Incorporated, novel silica based gels were formulated and used to encapsulate cells. Her data showed that one gel formulation was able to stabilize the cells in a wide range of field conditions, paving the way for cell-based biosensors to be used in the field. Her research involved mastery of cell culture techniques, exposure to collaborative research with a private company, and the use of cutting-edge technology such as the Electric Cell-substrate Impedance Sensing (ECIS).

**Faculty Mentor**
Theresa Curtis,
Associate Professor,
Biological Sciences

“Over the summer, I have seen Imani transform into a confident enthusiastic undergraduate researcher ready to apply to Ph.D. programs.”
Zachary Taillie

Exercise Science

Exercise Science Effects of altitude training masks on lung function, cardiovascular performance, and cycling efficiency

“This research project has taught me things that you simply cannot learn by sitting in a classroom — this is the best summer I have ever had.”

Zach’s research explores the use of altitude training masks by athletes in an attempt to gain an advantage in cardiovascular endurance. Many athletes will train with the mask on and then remove it for a competition. Using the College’s Computrainer™ cycling ergometer system coupled with bicycle resistance training and metabolic analyzer, Zach measured several parameters related to lung function and cardiovascular performance before and after four weeks of aerobic training with the altitude training mask. Over 60,000 data points were collected from each participant and will be statistically analyzed against a control group who performed the training without the mask to determine how much, if any, advantage is gained through the use of the altitude training mask.

Faculty Mentor

James Hokanson, Associate Professor, Kinesiology

“It is very rewarding as a professor to be a mentor to a student like Zach that is invested and engaged in his research project”
Developing and optimizing in-sample protein digestion and peptide extraction for MS/MS profiling of enzymes in soil and sediment

“This research opportunity has taught me how to use state of the art instrumentation like high performance liquid chromatography, gas chromatography, and the spectrofluorometer – all of which will be needed for my future career in Forensics!

Katie’s summer research has involved finding an ideal method for extracting peptides from soil samples. To do this, Katie has learned how to perform a trypsin digestion and extraction methods such as strong cation exchange and solid phase extraction techniques. She has also determined the ideal solvents, digestion times, and temperature in which these techniques can be performed at high efficiency. Katie has learned how to operate the High Performance Liquid Chromatography (HPLC) machine in order to separate her resultant peptides. In the coming semesters, Katie hopes to use this method and knowledge of techniques for future experiments looking at the microbial communities in environmental samples. This will give Katie, as well as other environmental scientists, a better understanding of these tiny, complex ecosystems, by identifying the thousands of different biomolecules being used.

Faculty Mentor
Jeffrey Werner, Assistant Professor, Chemistry

“In just a couple months time, Katie has taken a real leadership role in two different projects in our lab. Her URC-funded project on proteins and peptides has laid the groundwork for future researchers.”
Other Undergraduate Research Awards

The following undergraduate students were awarded a 2012-13 Undergraduate Research Council Travel Grants to attend conferences in which they were a presenter

Jeri Burke: Geological Society of America National Meeting (Charlotte, NC)
Megan Ferguson: Geological Society of America Regional Meeting (Bretton Woods, NH)
Brennan Gerlach: In Vitro Biology Meeting (Providence, RI)
Kristina Gutchess: Geological Society of America Regional Meeting (Bretton Woods, NH)
Collin Nowalk: Geological Society of America Regional Meeting (Bretton Woods, NH)
Tyler Potter: Annual Meeting of the American Chemical Society (New Orleans, LA)
Shawn Wilson: Annual Meeting of the American Chemical Society (New Orleans, LA)
Tucker Wright: Annual Meeting of the American Chemical Society (New Orleans, LA)

The following undergraduate students were awarded a 2012-13 Undergraduate Research Council Small Grants

Megan Ferguson: Carbon dioxide inclusions in Gore Mountain garnet
Ethan Giventer: Short Shorts video series
Brennan Gerlach: Novel wound healing assay using B-lapachone inclusion complexes

The following faculty were awarded a 2013-14 Undergraduate Research Council Undergraduate Research Assistant Awards

Helena Baert, Physical Education
Christa Chatfield, Biological Sciences
Theresa Curtis, Biological Sciences
Gayle Gleason, Geology
Andrea Harbin, English
Wanda Kent, Communications Disorders
David Kilpatrick, Psychology
Cathy MacDonald, Physical Education
Jill Murphy and Bonnie Hodges, Health
Randi Storch, History
Jeffrey Werner, Chemistry
Summer Fellow Alumni Spotlight

Carolyn Furlong ‘12

“The summer of my research fellowship was one of the most gratifying summers of my undergraduate degree -- it provided the starting point for my interest in research.”

Carolyn Furlong was a recipient of a 2010 URC Summer Fellowship to study small borings and other traces left by ancient worms and sponges in fossil seashells from the Devonian Period of central New York. Carolyn’s fellowship research ballooned into a much larger project than originally anticipated and has yielded significant results including the discovery of a fossilized worm trace new to science. Carolyn has made several presentations of her research including at the national Geological Society of America meeting held in Charlotte NC in 2012. More impressively, her research has been published in the internationally recognized peer-reviewed Journal of Paleontology.

After finishing at Cortland with a BS degree in Adolescence Earth Science Education, Carolyn was offered a full scholarship and teaching assistantship into the Masters degree program in Geological Sciences at the University of Alberta to conduct research in ichnology – the study of ancient animal traces preserved in the rock and fossil record. Her thesis research focuses on using modern traces of drilling and boring organisms found in rocky intertidal settings within the Bay of Fundy in eastern Canada and sea stacks in Oregon to help understand those found in the fossil record.

Carolyn examining modern borings in the rocky intertidal zone, Bay of Fundy, Nova Scotia, Canada.

390 million year old fossil brachiopod shell infested with the borings left by ancient worms. The worm traces (small tubes identified with arrows) belong to a species discovered by Furlong that is new to science and published in the Journal of Paleontology.
2013 Transformations: A Student Research and Creativity Conference

The College’s annual Transformations conference was held April 19th in Sperry Center. The event focuses on student research, defined as an original investigation or creative activity through the primary efforts of a student or group of students. Eighty-eight undergraduate student authors or co-authors presented their research and creative projects in either oral or poster format. Special sessions were devoted to the 2012 Summer Research Fellows.

Kristin Neal (undergraduate Biology student, 2012 SRF awardee) presenting her research on the Legionella bacterium to Bruce Mattingly (Arts and Sciences Dean).

Chelsea Lachman (undergraduate History student, 2012 SRF awardee) presenting her research on medieval relics to Michael Berzonsky (Distinguished Professor, Psychology).
SUNY Cortland’s Undergraduate Research Council promotes SUNY Cortland as an institution fully committed to student research, scholarship, and creative pursuits. To this end, the Council will assure that faculty and students have easy access to information and resources on best practices, mentoring, student publishing, and other forums for the dissemination of students’ scholarly works. Through funding provided by the offices of the Provost’s and Sponsored Programs, partnerships with Office for Resident Life and Housing, Financial Aid Office and the generosity of donors to the College Foundation, the Undergraduate Research Council directly supports research projects through a number of competitive fellowships and grants.

**URC Director:** Christopher McRoberts  
**URC Members:** Cynthia Benton, Philip Buckenmeyer, Terrence Fitzgerald, Joy Hendrick, Amy Henderson-Harr, Mark Prus, Sharon Steadman, and Orvil White  
**Administrative Support:** Haley Zurell

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Web: www.cortland.edu/urc  
Email:sunycortland.urc@cortland.edu