Undergraduate Research Highlights

Jared Hall (undergraduate Geology student) and Kristina Gutchess ('13 Geology) presenting at the Northeastern Meeting of the Geological Society of America (Lancaster, PA) in March 2014.

Joseph Hetzler (undergraduate Chemistry student and 2013 SRF Fellow) presenting his research at the 2014 SUNY Cortland Transformations conference.
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GET YOUR hands on RESEARCH
The year in undergraduate research

The 2013-14 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 continued its trend of increasing collaborative curricular and co-curricular research projects between undergraduate students and faculty mentors. On the curriculum side, we are pleased to announce the creation of the undergraduate research course attribute. This attribute will provide a means to formally recognize students for these high-level learning experiences. The UR attribute will also permit the institution to assess levels of research/creative activity among our students and assess how well the college is meeting its stated mission/goals as pertaining to experiential learning.

Of particular note this year was the establishment of the President’s Recognition for Engaged Learning and Leadership Designation in Undergraduate Research. The inaugural award was made to Tyler Potter ’14 for his high-level achievements and participation in independent research spanning the entire four years of his tenure at Cortland (see p. 17).

Additionally, the College has begun to officially recognize the extraordinary passion and commitment of faculty in mentoring undergraduate research students. Through a competitive review of an excellent applicant pool, the first Outstanding Achievement in Mentoring Undergraduate Research award was made to Dr. James Hokanson (Kinesiology Department) for his high-level achievements and dedication in mentoring undergraduate research students during his time at Cortland (see p. 18).

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
Nicholas Ayvazian
Biology

Examination of sexual variation and population genetics of the Jack-in-the-pulpit subspecies complex (Arisaema triphyllum subsp. triphyllum. and subsp. stewardsonii)

“The Summer Research Fellowship was one of the greatest experiences I have ever had. It made me a better scientist and a more rounded person. Through my research I have learned many techniques that will help me during my graduate studies.”

Nick is researching Jack-in-the-Pulpit (Arisaema triphyllum) which is a herbaceous forest perennial. This species is unusual because plants undergo a sexual change during their long-lives. In New England, two subspecies of Arisaema triphyllum (subsp. triphyllum and stewardsonii) can be found in segregated habitats. The objectives of the study were to define the differences in leaf and inflorescence, morphology, and population genetics between these subspecies using both field and laboratory techniques such as enzyme electrophoresis. The results of the study have interesting implications as the two subspecies differ in chromosome number. Arisaema triphyllum ssp. triphyllum is tetraploid (four sets of chromosomes), whereas A. triphyllum ssp. stewardsonii is diploid (two sets of chromosomes). We predict that the differences in chromosome number will account for significant differences in reproductive and vegetative traits.

Faculty Mentor
Steven Broyles, Professor. Biological Sciences

“Nick has been introduced to tough field work by overcoming poison ivy, forest of brambles, and waist-deep swamp water. His work will provide important insights on the relationship between plant sexuality and chromosome number in Jack-in-the-Pulpit..”
Summer Research Fellow

Toni Bucklaew
Anthropology

Archaeological work at the site of Çadir Höyük, Yozgat Province: Byzantine Anatolia

“Crystal skulls, hidden tombs, lost temples and dinosaur bones? Never found any of those while researching, but I did find the past, endless dirt, and my future.”

Toni’s archaeological research project involves critically analyzing the small finds at the site of Çadir Höyük, located in central Turkey in the Yozgat province, to identify wealth patterns of the elites and farmers who lived at the site in Byzantine Anatolia from 400 C.E. to 1070 C.E. Also, her project involves comparing the small finds at Çadir to two other contemporary sites, Amorium and Kilise Tepe, in order to create a regional wealth spectrum. The interpretations from the Byzantine personal items, tools and weapons provides a sounder foundation to understanding the people who lived in that time period. Her research involves not only the archeological excavation of artifacts on site in Turkey, but cataloging the finds and assigning realtive “wealth” indicators of each item to better assess the social and economic status of the site’s inhabitants. Her databases and information will be a stepping stone for later research into rural Byzantine Anatolia about which little is known today.

Faculty Mentor
Sharon Steadman, Professor, Sociology/Anthropology

“Toni is the consummate researcher. I have to encourage her to stop doing work at the end of the day! Her contributions in helping us to understand life in the first millennium at a rural Byzantine site will be invaluable.”
Discovering protein diversity in a bioreactor making hexanoic acid from biomass

“Being able to view science from multiple different viewpoints has given me the tools necessary to be successful as I eventually head into a graduate program in Environment Engineering.”

Dylan’s research involves detecting enzymes that bacteria use to make the biofuel precursor hexanoic acid. His research is part of a larger collaboration between SUNY Cortland and Cornell University, funded by the National Science Foundation, to develop a bioreactor that makes liquid fuels from organic waste. The bioreactor consists of a complex, poorly-defined community of thousands of different bacteria. Dylan is examining which microbes are performing a specific biomolecular pathway leading to hexanomic acid a valuable precursor of biodiesel. During the summer, Dylan developed protein identification methods on SUNY Cortland’s new liquid chromatography / mass spectrometry (LC-MS) instrument, processed samples, and performed computational bioinformatics. His results will determine which bacteria in the bioreactor are critical for making the desired product. The ultimate goal is to make the bioreactor more robust, so that it can be industrialized and provide a new sustainable energy source.

Faculty Mentor
Jeffrey Werner, Assistant Professor, Chemistry
“It’s been great having Dylan getting started in the lab so early. I’m looking forward to working with Dylan for the next two years. His research will have a real impact on the field of biofuel research.”
Institutional linkages to foster employment through the creation of new business enterprises

“This research experience has been nothing short of extraordinary. I’ve really had an opportunity to dig into something I’m really passionate about and get a real feel for what people do in my field.”

Tom’s research involves researching a cooperative in Spain called Mondragon and finding ideas and lessons that can be utilized by New York State in their new Start Up NY initiative. The Start Up NY initiative plans to create tax free zones surrounding the universities in order to bring in business and foster employment. Mondragon is already in the midst of a successful experiment with the linking of institutions to foster a better economy and create jobs. During Tom’s summer research term he has been reading academic literature and literature directly from Mondragon itself to draw lessons from the cooperative and reasons for Mondragon’s success. A central aspect of Tom’s research is to create a cross-referenced annotated bibliography in English from the Spanish texts and documents from Mondragon. Tom and his advisor German Zarate hope that their results aid in improving Start Up NY and help create a more effective initiative.

Faculty Mentor

German Zarate-Hoyos, Professor, Economics

“The Summer Research program allowed me to know Tom Lee as a student-scholar and I was very impressed with what he accomplished in a short period of time.”
### Development of metabolic equations to estimate caloric cost of un-weighted treadmill exercise

“The knowledge that I have gained in data collection and use of equipment in the Kinesiology field has been invaluable.”

The purpose of Adam’s research is to measure how many calories are burned during un-weighted running. Running at a reduced percentage of one’s body weight lowers the ground reaction forces and reduces the impact on the runner’s joints, tendons and ligaments. With his advisor, Jim Hokanson, Adam is also investigating the effects that un-weighted running has on run economy and run mechanics. Adam’s research involves collecting oxygen consumption data of participants fitted with a harness running on a treadmill with the Kinesiology Department’s VO2 Analyzer. Data Adam collected provides the basis for developing a mathematical regression model to better describe and predict the caloric cost of weighted and un-weighted running activity. The results of the study will help exercise specialists better design the intensity of exercise sessions during patient rehabilitation when running on an un-weighted treadmill. In addition, exercise programs can be better designed for overweight and obese individuals who use such treadmills to run again without joint pain.

### Faculty Mentor

James Hokanson, Associate Professor, Kinesiology

“It is very rewarding as a mentor to have the opportunity for ‘teachable moments’ during the student research process.”
Ashley Martin
Psychology

The effects of the mindful, acceptance, & commitment (MAC) protocol on college athletes well-being, sleep, electroencephalogram (EEG), diet, and activity level

“This summer research fellowship has been a great learning experience for me. I have learned new research protocols and procedures and it has helped me become more independent as a researcher.”

Ashley’s research involves experimenting to see if different types of meditation exercises help improve athletes’ performance and sleep quality. An electroencephalogram (EEG) was recorded on each participant prior to starting the meditation exercises. Prior to receiving the meditation exercises, each participant took a series of five surveys, and also received a bracelet, called the Fitbit Flex. This bracelet records the participants’ daily mileage, caloric intake, number of steps per day, and sleep quality (how many minutes each runner was awake, restless, etc.). During this summer, Ashley spent time with each participant running the meditation sessions. Ashley and her mentor Jeff Swartwood hope to see a positive change in the participants’ EEG results, as well as have a positive effect on their performance and sleep.

Faculty Mentor
Jeffery Swartwood, Associate Professor, Psychology

“Ashley is a natural researcher. Her attention to detail and strong work ethic serve her well in a research setting. As a faculty mentor, it is exciting to see how the reality of conducting a research project fosters the creative mind and inquisitive spirit.”
Karen Martinez
Exercise Science

**Physical activity participation patterns among Latinos in the northeast**

“Working as a research fellow has been an amazing experience that has allowed me to meet many different people. It has truly made my summer more enjoyable.”

Karen believes that it is important to examine issues that are found throughout our society. For instance, obesity and heart disease has become an epidemic in the United States. According to the Centers for Disease Control and Prevention more than one-third of adults in the United States are considered to be obese. Furthermore, research suggests that obesity affects certain groups of people disproportionately. Non-Hispanic blacks have the highest rates of obesity (47.8%) followed by Hispanics (42.5%) and non-Hispanic whites (32.6%). Karen’s research project focuses on understanding the physical activity patterns among Latinos living in the northeast of the United States. She feels that it is important to understand why some groups of people are more physically active than others. Her study looks at culture, acculturation, income, education, and geographical area of the participants. She hopes to learn more about the physical activity patterns among the fastest growing ethnic population in the United States, as this group oftentimes left behind when it comes to research.

**Faculty Mentor**
Katherine Polasek, Assistant Professor, Kinesiology

“Working with Karen on this project has been fantastic. Her research is highly relevant to the field due to our increasingly hypokinetic society. Furthermore, her decision to examine an oftentimes underrepresented community makes her findings even more valuable.”
Nicole Miller
Community Health

A pilot study to assess anthropometric, physical and mental health status of a cohort of orphaned children in Mangalore, India

“Traveling to India was an amazing experience that has opened my eyes to different ways of life. Traveling can teach what cannot be learned in a classroom.”

Nicole and Dr. Curtis traveled to southern India to conduct a needs assessment of orphan children in the Palani Hills. Nicole collected data from children who had come from aboriginal jungle villages to live in a tribal children’s home in the city of Kodaikanal. This was a challenging task because of language barriers and cultural differences. These children and their families are outcasts, even within Indian society, and as a result they are often shy around strangers. Using participant observation—living and playing with the children—Nicole was able to gain their trust. Through these interactions and by interviewing caregivers, physicians and teachers Nicole was able to better understand the physical, emotional and environmental needs of the tribal children. Nicole and Dr. Curtis will use this data to develop an enduring program in which new groups of SUNY Cortland students will return to the Palani Hills each year to work to address the health needs of the tribal children.

Faculty Mentor
Jena Nicols Curtis, Associate Professor, Health

“Nicole was able to connect with the children on a completely different level. They kept calling, “Sister, sister!” and demanding that she play with them or take their picture. Being able to have Nicole conducting research with me not only gave the project more data, but also another, fresher perspective.”
Investigations on intra- and interspecific interactions of terrestrial planarians

“This research experience has taught me to ‘think like a scientist and about the process of posing questions and investigating them. These skills cannot be learned in a classroom and will be beneficial as I plan to go into medicine.”

Allie’s research focuses on the predator-prey interactions between two Asian species now invasive in North America. The predator, Bipalium adventitium, is a terrestrial planarian now widely distributed across this country. They are known to track and feed on a broad range of earthworm species. The prey species are earthworms of genus Amynthas, which differ ecologically from most earthworms in the US. Amynthas can occur in great densities and have the capability of changing soil composition. Allie’s project involves literature review of these two species, preliminary observations, experimental design and analysis. Her analyses (often involving the filming of the worm behaviors) are aimed at investigating the ability of Bipalium adventitium to detect and follow chemical trails of Amynthas. In addition, she explores the anti-predator behavior of Amynthas.

Faculty Mentor
Peter Ducey, Professor, Biological Sciences

“Allie brings a combination of curiosity, solid organizational skills, and a great work ethic to the project. She’s building off the experimental and observational research of other scientists to explore new questions with these fascinating organisms.”
Casey Peterson
Biology

Study of the unknown extracellular polymeric substances (EPS) contained within Legionella pneumophila (Lpn) biofilms

“I believe that my experience during this fellowship has been essential for my growth not only as a scientist but as a person”

Casey’s research this summer involves studying the biology of the bacteria Legionella pneumophila (Lpn), which can lead to a serious pneumonia known as Legionnaires Disease. Lpn is found in the environment as part of thin, sticky layers known as biofilms, often as part of multi-species microbial communities. Biofilms are held together by a variety of extracellular polymeric substances (EPS) secreted by bacteria. Throughout the research fellowship, Casey’s focus has been on figuring out the composition of the EPS of Lpn biofilms. The first part of the research consisted of quantifying the basic protein and polysaccharide content of Lpn biofilms. Secondly, the EPS content was measured by treating Lpn biofilms with various EPS-targeting enzymes in hopes of observing detachment or disruption of the biofilms. Casey and his advisor Dr. Chatfield hope that this knowledge will aid in developing ways to eradicate Lpn biofilms from the environment and thus prevent infection by Lpn.

Faculty Mentor
Christa Chatfield, Assistant Professor, Biological Sciences

“Casey has gotten some very important data this summer on the biological components of bacterial biofilms—summer research and mentoring is such a fun and exciting part of my job”
Weifeng Zhen
Chemistry

Characterization of the binding determinants for Salicylate Hydroxylase

“I’m one step closer to fulfilling my aspirations for cancer research. Working with Dr. Hicks through the summer fellowship provided skill sets that will help get me there.”

Wei’s research investigated the bioremediation capability of the organism *Pseudomonas putida*. This organism encodes an enzyme that is able to metabolize molecules that are similar to benzene, a byproduct of industrial toxins. These molecules are called “enzyme substrates.” In this research project, Wei focused on the binding affinity differences between the enzyme and two similar substrates. He compared the binding between the enzyme and its natural substrate to another molecule, which is highly structurally related to its natural counterpart. By comparing the binding affinity of the two substrates we are able to tell how this small structural difference impacted affinity. Wei’s work is critical for understanding the catalytic mechanism by which this enzyme turns its substrate into product. Once this mechanism is characterized, we can begin to alter the enzyme’s substrate specificity allowing for application to bioremediation efforts.

Faculty Mentor
Katherine Hicks, Assistant Professor, Chemistry

“Wei’s project involves performing biochemical studies to determine the catalytic mechanism of a previously uncharacterized enzyme, which has applications for bioremediation efforts. Working with Wei over the summer has been a great experience. I’ve watched him take ownership of this project and make meaningful, independent contributions to the work.”
Other Undergraduate Research Awards

The following undergraduate students were awarded a 2013-14 Undergraduate Research Council Travel Grant to attend conferences in which they were a presenter

Aaron Bound: Annual Meeting, NY Foundations of Education Association (Hamilton, NY)
Joseph Cataldo: Geological Society of America Regional Meeting (Lancaster, PA)
Eric Fisher: Geological Society of America Regional Meeting (Lancaster, PA)
Jared Hall: Geological Society of America Regional Meeting (Lancaster, PA)
Abigail Stewart: 2014 AAHERD National Convention and Expo (St. Louis, MO)
John Wiant: Geological Society of America Regional Meeting (Lancaster, PA)

The following undergraduate students were awarded a 2013-14 Undergraduate Research Council Small Grant

Nathan Barbour: Effects of exogenous and endogenous pre-cooling on a 20-km time trial in the heat
Erik Fisher: Understanding the changes of the dissolved ion concentrations and water temperature in the Tioughnioga River, New York
Natalie Gregory: Study of predation by the flatworm Dugesia dorotocephala on different sized snails of the species Lymnaea stagnalis
Jared Hall: Upper Devonian seismites of central and south-central New York

The following faculty were awarded a 2014-15 Undergraduate Research Council Undergraduate Research Assistant Award

Leslie Eaton & Raymond Collings, Psychology
Katherine Hicks, Chemistry
Wanda Kent, Communications Disorders
Christopher McRoberts, Geology
Jill Murphy and Bonnie Hodges, Health
Randi Storch, History
Summer Fellow Alumni Spotlight

Michael Wolfin ’11

“Cortland gave me the freedom to explore my scientific interests, as well as the training I needed to get to the next level; a combination I feel I could not have received anywhere else”

Michael Wolfin was a recipient of a 2010 URC Summer Fellowship to study the chemical and behavioral ecology of the invasive pest insect *Cactoblastis cactorum*. Mike had much success working with Drs. Terrence Fitzgerald and Frank Rossi on this project, coauthoring a paper recently published in the *Journal of Insect Science*. He feels the most significant product of his research, however, is the skillset of relevant chemical and behavioral methods he developed while working on the project.

Mike graduated from Cortland in 2011 with BS degrees in Chemistry and Biological Sciences, and is currently working on his PhD as a member of the Entomology Department at the New York State Agricultural Experimental Station, Cornell University under the advisement of Dr. Charles Linn. As both an undergraduate and graduate student, he has presented his undergraduate research numerous times. Most notably, he gave a department seminar for the at the Max Planck Institute for Chemical Ecology in Jena, Germany, the premier research institution in the field of chemical ecology. He is also having success in his work at Cornell, having twice been the recipient of the Mike Villani Graduate Student Research Award in Applied Entomology, and the George G. Gyrisco Graduate Student Research Award in Applied Entomology for his work in studying the chemical ecology of the grape berry moth (*Paralobesia viteana*). Mike will be presenting his current research at the Entomological Society of America Annual Meeting this November in Portland, Oregon.

A representative grape berry moth head prepared for gas chromatography coupled with electroantennographic detection (EAD). Mike uses GC-EAD to understand what odors this pest uses to locate its host plant.

Mike at the microscope preparing a grape berry moth antenna for analysis.
The College’s annual Transformations conference was held April 125th 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. Seventy-four SUNY Cortland undergraduate student authors or co-authors presented their research and creative projects in either oral or poster format. Special sessions were devoted to last year’s Summer Research Fellows.

Renee Bullard (undergraduate Biomedical Science student, 2013 SRF awardee) presenting her research on PCB intake in rats

Adam Graham (undergraduate Chemistry student, 2013 SRF awardee) presenting his research on microbial bioinformatics
The third SUNY-wide symposium of undergraduate research and creative activities took place on Tuesday April 1, 2014, in New York State Legislative Office Building in Albany, NY. This showcase featured research, scholarly, and creative activities by undergraduate students from across all 64 SUNY institutions, including four-year institutions and community colleges, emphasizing undergraduate student research projects and their impact on New York State. This celebration is designed to bring together some of SUNY’s most talented undergraduate scholars with SUNY Administration officials and members of our New York State Legislative delegation and their office staff. The midday poster session allowed SUNY undergraduates the opportunity to present their research and creative academic projects to a large audience at Albany’s Legislative Office Building.

Two SUNY Cortland research projects conducted by undergraduate students were selected through a campus-wide competitive review to represent Cortland at this event. Exercise science majors Josh Hammond and Samuel Lebowitz presented on their research “Foam rolling and static stretching’s effect on acute range of motion” and chemistry major John Chodkowski presented his finding on The perturbation of benthic microbial communities with microbiocide compound DBNPA.
President’s Recognition for Engaged Learning and Leadership Designation in Undergraduate Research

Tyler Potter ‘14

SUNY Cortland’s innagural recipient of the President’s Recognition for Engaged learning and Leadership Designation in Undergraduate Research was awarded to Mr. Tyler Potter. As new award, the President’s Recognition for Engaged Learning and Leadership in conferred upon students who have achieved exceptionally high level of engaged learning and are student leaders.

Mr. Potter, recently graduated chemistry student, has been actively engaged in multiple original research projects. Tyler began working in the laboratory of Dr. Karen Downey (Assistant Professor of Chemistry) where he researched phase transition kinetics using thin films of mixed metal oxides. He later began research under the supervision of Dr. Frank Rossi (Associate Professor of Chemistry) synthesizing organic molecular compounds the pheromones that may aid in the of the control invasive cactus moth Cactoblastis cactorum. It is largely his work that has provided the basis for a peer-reviewed journal article under preparation and two grant proposals.

In 2012, Tyler was a recipient of a prestigious SUNY Cortland Summer Research Fellowship and continuously engaged in independent research through the Chemistry Department. Tyler has presented his research in at several national professional meetings of the American Chemical Society, was selected (through a competitive review) to represent SUNY Cortland at the 2012 SUNY Undergraduate Research Symposium in the state capital, and also made presentations at the SUNY Cortland’s Transformations event. Mr. Potter was formally recognized for this award at the 2014 SUNY Cortland Honors Convocation this past April. Mr Potter graduated Cortland in May 2014 with a B.S. in Chemistry. He is currently begining graduate study in the PhD chemistry program at Yale University.
Outstanding Achievement in Mentoring Undergraduate Research Award

Jim Hokanson

This is a newly created award to recognize faculty who have demonstrated extraordinary commitment as mentors of Cortland’s undergraduate students in research, scholarship or creative activities. This year’s awardee, Dr. Jim Hokanson, has a long and sustained record of passion and dedication to mentoring undergraduate researchers. Beginning during his first year as Assistant Professor in 1999, Dr. Hokanson has shown an impressive and continual record of mentoring student researchers and has amassed a remarkable number of publications with student co-authors over his fifteen-year career in SUNY Cortland’s Kinesiology Department. He has mentored many independent students and summer research fellows and has initiated cross-departmental collaborations with students and faculty. His mentoring success results in large part from his student-centered approach. He encourages his students to develop research possibilities based off their own personal interests, to take ownership of their research and to explore the research beyond their comfort zone. He believes that student research does not take place in a vacuum, but requires teamwork and faculty-student and student-student collaboration. In particular, Dr. Hokanson understands the positive impact on students’ scholarly ability by exposing them to the research of faculty and other professionals within the discipline.

His student recommenders, in particular, have indicated their research experiences under Jim’s direction and his mentoring had a very positive and lasting impact on their professional and personal development.

“Dr. Hokanson puts everything he has into his teaching and mentoring so his students have a top-level education at Cortland. His students will carry these lessons and experiences with them throughout the rest of their educational journey.”

Shawn Jackett
SUNY Cortland ‘03
Undergraduate research at SUNY Cortland remains strong due in part to the generosity of donors. Gifts are used to enrich our programs, provide direct support for important student-faculty research collaborations, and to recognize our top student researchers and their faculty mentors. Financial support at any level makes a statement and is appreciated.

Donations to the Undergraduate Research Fund can be made online or by mail. Please make your check payable to: Cortland College Foundation and indicate on check the name of the Undergraduate Research Fund. Mail to: Cortland College Foundation, Inc., P.O. Box 2000, Cortland, NY 13045. You can also make an online donation at: cortland.edu/giving and click the Give Now option on the right side of the page.
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, Phil Buckenmeyer, Jeremiah Donovan, Terrence Fitzgerald, Jill Murphy, Richard Powell, 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