SUMMER RESEARCH PROGRAM
RESEARCH SYMPOSIUM & LUNCHEON

Wednesday, July 27, 2016
11:00 a.m. – 1:30 p.m.
University at Buffalo
Newman Center ~ North Campus
PROGRAM ORDER

WELCOME
SHANNA CRUMP-OWENS
Director, Collegiate Science & Technology Entry Program (CSTEP)

OPENING REMARKS
DR. ANDREW M. STOTT
Vice Provost, Dean of Undergraduate Education

LUNCHEON & SLIDESHOW NARRATIVE
NELSON M. RIVERA
Graduate Assistant

STUDENT PERSPECTIVES
Kaytlan LoCicero, Cohort Leader
Ali Al Qaraghuli, Cohort Leader
Tanahiry Escamilla, Summer Intern
Jarrett Franklin, Summer Intern

POSTER COMPETITION & JUDGES PRESENTATION
LAVONE RODOLPH
Research Methods Instructor
Doctoral Student, Computer Science & Engineering

FACULTY MENTOR & STUDENT AWARD PRESENTATION
SHANNA CRUMP-OWENS
CSTEP Director

CLOSING REMARKS
SHANNA CRUMP-OWENS
CSTEP Director

“TO WHOM MUCH IS GIVEN, MUCH IS EXPECTED”
Welcome to the 10th Annual CSTEP Summer Research Symposium! Our 8.5-week Summer Research Program enhances the competitiveness of talented underrepresented students pursuing STEM and the allied health professions. I congratulate their dedication to scholarly excellence and research – they are exemplars among their peers. Today, we celebrate the fruition of their hard work as they present their research to peers, faculty and staff; they can look back on their efforts with pride.

Our goal was to structure a holistic, engaging, and transformative experience which provided our students with a fundamental understanding of how research plays an important role in tackling complex societal challenges. I am confident that the structure of our program deepened their understanding of research and how much their respective fields will gain from their knowledge, skills, and experiences.

A significant and effective tool in increasing the enrollment of underrepresented students in graduate programs is to provide them with opportunities to conduct research early in their undergraduate careers. Our research interns have broadened their knowledge and gained insight into critical issues, while developing analytic, leadership, and problem solving skills. In addition, this summer experience allowed them to gain a better perspective of research and its role in society. They also learned the value of teamwork and collaboration which are both essential in today’s research and work environments.

To our faculty research mentors, workshop facilitators, tour guides and research methods seminar instructor which number more than 40 - thank you for your time, and expertise. We could not successfully execute the summer research program and create community among this diverse group of talented students without the contributions with UB faculty and staff. We value our collaborations with you and look forward to continued collaborations.

We are confident that the research experience, research methods course, seminars, and fieldtrips fostered a sense of community while enhancing an undergraduate career. I encourage each CSTEP Scholar to continue taking advantage of the resources, opportunities, and services offered by CSTEP to make your UB experience more personal. We hope you found the support, guidance, and nurturing environment we provided to be beneficial. Also, remember the CSTEP motto: “To whom much is given, much is required.” It was a pleasure to work with you.

SHANNA CRUMP-OWENS
CSTEP Director
WHAT’S IN IT FOR ME?
THE PERKS OF JOINING UB CSTEP

CSTEP offers valuable tools - advisement, tutoring, paid research internships, scholarships, service learning, specialized courses and travel to conferences and workshops, which empower students to become successful in their chosen profession. Our alumni have made major contributions in both their careers and communities. Many of these same graduates report that CSTEP played a key role in helping to develop the confidence and skills necessary to navigate through their college years and into the profession of their dreams.

UB CSTEP offers the following programs and services for our students:

PAID RESEARCH & INTERNSHIP OPPORTUNITIES
Paid research and internships are an integral part of CSTEP - to introduce talented underrepresented students to the culture of research, provide insight related to their major and expose students to the rigors of graduate study. The CSTEP Research Internship Program exposes selected students to research and career opportunities in their major. CSTEP works with students to identify faculty research mentors or internship supervisors.

ACADEMIC YEAR RESEARCH/INTERNSHIP PROGRAM
During the academic year, interns work for 12 weeks per semester under the guidance of a research mentor or internship supervisor. Students are assigned a research project for up to 10 hours per week, at the discretion of the research or internship supervisor. Students are awarded a research stipend from CSTEP during their research or internship experience.

SUMMER RESEARCH PROGRAM
The CSTEP Summer Research Program is an intensive 8.5-week program designed to enhance the competitiveness of talented underrepresented students pursuing STEM and the allied health professions. The program strengthens participants’ research skills and exposes them to the rigors of graduate study. Students are matched with faculty to conduct research for 30 hours per week. In addition to gaining research experience, students participate in a research methods course, seminars, and field trips. As a capstone, at the end of the program, students present their research to their peers, faculty and the University community during our Annual Research Symposium. The summer program takes place from the beginning of June through the end of July. Applications are due in March of each year.

TUTORING
CSTEP students have access to the CPMC Academic Resource Center (ARC) which offers tutoring in courses identified as consistent challenges for students such as anatomy, biology, calculus, chemistry, pharmacology, physiology, physics, and engineering.

FUNDING OPPORTUNITIES FOR CONFERENCES
CSTEP covers travel expenses for selected academic, career, and graduate school conferences and enrichment programs. These opportunities boost students’ leadership skills, while building their resumes.

GRADUATE SCHOOL PREPARATION
CSTEP awards scholarships to students for Kaplan Review Courses, which provide preparation for standardized graduate entrance exams, including the GRE, MCAT, LSAT, GMAT, and PCAT exams.
SERVICE LEARNING PROJECT
A cohort of 25 students is selected to engage in a semester-long structured service learning project, becoming a Community Health Educator (CHE). The goal of CHE is to increase the number of minorities participating with the organ donor registry. This goal is achieved by engaging students pursing allied health majors in service learning, and training them to conduct educational workshops for UB students, and facilitating a campus-wide organ donor registry drive. Our partner for the CHE Service Learning Project is Upstate NYS Transplant Services (UNYTS).

CSTEP SHADOW DAY
CSTEP students serve as mentors to high school students enrolled in the Science Technology Entry Program (STEP). As mentors, CSTEP students allow STEP students to “shadow” them by attending classes with them to get a glimpse of what college classes are like.

THE CSTEP ANNUAL DAY OF SERVICE
CSTEP students visit local high schools in the Buffalo Public School System to share their collegiate experiences with students in their classrooms. This serves as a vehicle to give students from targeted high schools “college knowledge” while also introducing them to STEM fields and the licensed professions.

HABITAT FOR HUMANITY
CSTEP students team up with Habitat for Humanity Buffalo, a non-profit charitable organization seeking to alleviate the shortage of affordable housing both within the U.S. and abroad. Through volunteer labor and donations, the Habitat for Humanity Buffalo has built and rehabilitated over 225 homes for families who have difficulty obtaining a home through other means.

SUPPORT FROM THE CSTEP NETWORK OF STAFF, STUDENTS, AND ALUMNI
We offer academic, career, and personal counseling to assist students in overcoming difficulties, finding solutions, and establishing their priorities. The CSTEP Newsletter, website, and Student Recognition Dinner recognize the achievements of our students and help build the camaraderie that our students have come to rely on.

MONTHLY EVENTS, WORKSHOPS, AND ENRICHMENT ACTIVITIES
Students who attend our monthly meetings gain invaluable advice as they have the opportunity to learn from each other's experiences and receive professional advice from alumni and guest speakers. Below is a list of several of this year’s workshops and enrichment activities:

| CSTEP Welcome Back BBQ | Graduate School Panel |
| ABC’s of Graduate School | End of Semester Reception |
| CSTEP Shadow Day | Rx for Success Seminar (Medical School) |
| Maximize Your Potential | Blueprint for Success |
| Rx for Success Seminar (Pharmacy School) | Statewide Student Conference |
| CSTEP’s Day of Service | Student Recognition Dinner |
| Effective Study Skills | Student Research Luncheon |
| Time Management | Summer Research Program |

CSTEP CAREERS
Architect • Audiologist • Biologist • Dietitian • Certified Public Accountant • Chemist • Chiropractor • Computer Scientist • Dentist • Geologist • Engineer • Lawyer • Mathematician • Medical Doctor • Midwife • Nurse Practitioner • Occupational Therapist • Occupational Therapy Assistant • Optometrist • Pharmacist • Physical Therapist • Physicist • Podiatrist • Psychologist • Physician Assistant • Registered Nurse • Respiratory Therapist • Social Worker • Speech-Language Pathologist • Veterinarian
CSTEP addresses the shortages of underrepresented students both in the Science, Technology, Engineering, Mathematics (STEM) and the licensed professions. Resources available to CSTEP students include: paid research with faculty, internships, graduate school preparation, scholarships for standardized test preparation, academic and career advisement, tutorial services, monthly seminars, travel to professional conferences, and a support network to assist promising students in achieving their academic and professional goals.

During our previous grant cycle, CSTEP received the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM). This award, administered by the National Science Foundation, recognizes individuals and organizations that have demonstrated a commitment to mentoring students and increasing the participation of minorities and women in Science, Technology, Engineering, and Mathematics (STEM). Awardees serve as exemplars to their colleagues in the national effort to develop the nation’s human resources in the STEM professions.

Did You Know...?

- **More than 90%** of UB CSTEP students have entered into the CSTEP targeted professions or attended graduate school after obtaining their bachelor’s degree.

- **More than half** of all CSTEP Students possess overall GPA’s above 3.0.

- Last year, UB CSTEP exceeded our program enrollment goal of **305** by **25%**! Our current enrollment is **386** students.

- Since the program’s inception, UB CSTEP has awarded over **150** CSTEP/Kaplan scholarships to students in preparation for standardized graduate school exams (PCAT, MCAT, GMAT, LSAT, and GRE).

- This year, CSTEP and CURCA sponsored **16** students, staff, and alumni, including **8** students who presented their research at the 24th Annual CSTEP Statewide Conference: Journey’s Beyond Excellence in Lake George, NY.

- This year, **30** CSTEP students were placed in funded research internships and completed over **7,000** hours.

- This year, there are **125** students in CSTEP’s graduating class. *Congratulations, Class of 2016!*
Research exists in many forms. Whether it is a child turning over rocks to look for bugs, or a NASA scientist combing the night sky in search of extraterrestrial life, research and understanding are integral facets of human behavior. For many students, it is an essential part of the undergraduate experience. The Collegiate Science and Technology Entry Program (CSTEP) Summer Research Program is a comprehensive experience which aims to present students with an opportunity to learn from experts in their fields. For eight weeks, we worked closely under the guidance of a faculty mentor, while also receiving interpersonal enrichment and professional development. The program prepares students for the laboratory environment and serves as a catalyst for their future endeavors.

Students of the CSTEP Summer Research Program are engaging in research for a medley of reasons. Many of them see it as an invaluable learning experience. Lucas Rugar, a senior majoring in Civil Engineering, believes that “research greatly improves your critical thinking.” He sees research as an avenue for students to learn valuable skills from professionals in academia. As a senior Computer Engineering major and native of Harlem, NY, Dominique Hickson shares a similar view. Dominique says, “It is interesting that you can be a part of a discovery one day. Research not only broadens your knowledge but you’re networking with other professionals you can bounce ideas off of.” Many students see research as a method of interacting with knowledgeable professionals in her future career.

Through their experiences, students catch a glimpse of the day-to-day workings of experts in their fields. Diamile Tavarez, a junior in Biological Sciences, is making the most of her experience by using it as “an opportunity to go beyond the classroom.” Diamile also sees the importance of networking through this summer and hopes to learn the intricacies of professionalism and effective communication. Tanahiry Escamilla believes research “allows you to work on projects that you will be learning about in future classes. You have a critical advantage in your learning.” Tanahiry is in her junior year studying Chemical Engineering, and her research focuses on the “Surface Modification on Membrane for Wastewater Treatment.”

Jarrett Franklin, a Biological Sciences student hailing from Missouri, views this opportunity as a bridge between university and industry, stating: “[Undergraduate research] helps you make key relationships with companies your lab may be partnered with.”

In addition to networking, many students see research as the precursor of innovation. “Research allows me to be an expert in a field not many know about,” says Alejandro Falca, a senior majoring in Medicinal Chemistry. Falca’s research concerns the synthesis and characterization of nanostructured inorganic materials designed to undergo light-induced electron transfer. Mohammed Karim, a senior Biological Sciences, sees his research as a way to learn new ideas, hoping to “generate innovative solutions to real world problems.” To Malik Davies, research helped him “learn how to design an experiment from scratch.” Malik is working on the “Synthesis of Yolk-Shell Structured Silicon-Germanium Anodes for Lithium-ion Batteries.” Anna Huang, a senior majoring in Social Sciences, says of her research experience: “This program has shown me that research is a process and you have to be patient with that process.”

Kaytlan LoCicero also hopes to leave her mark on history. Kaytlan is a junior intended on nursing school, investigating “Physicians’ Influence on Prostate Cancer Patients’ Treatment Decision.” She said, “your work has the chance to be published; you can be a part of something bigger.” According to Andrew Alegria, “research opens a lot of doors. It can be used as a very big stepping stone to go on to more internships with other mentors and experts within your field.” Andrew is in his third year as a student in the Department of Mechanical Engineering.

Each student has their own reasons for conducting research. For some, it presents an opportunity to gain invaluable career experience. Others see it as a chance to gain recognition as innovators. Nonetheless, research is an integral part of the undergraduate experience. Through the enrichment of the CSTEP Summer Research program, our students learn the importance of research, gaining skills to use in education, the workforce, and beyond.

~2016 CSTEP Summer Research Cohort
Naza Abdelrahman

HOMETOWN: Brooklyn, NY  
MAJOR: Biomedical Sciences  
INTERNSHIP PLACEMENT: Buffalo Clinical and Translational Research Center  
SUMMER MENTOR: Dr. Alice Ceacareanu  
SUMMER MENTOR TITLE: Assistant Professor  
DEPARTMENT: Pharmacy and Pharmaceutical Sciences  

SUMMER PROJECT: Metformin Attenuates the Detrimental Effects of Insulin in Head and Neck Cancer  
ABSTRACT: Long-term survival among patients with diabetes mellitus (DM) and head and neck cancers (HNC) remains low despite advances in surgery, radiation, and chemotherapy. The present research evaluates DM pharmacotherapy influence on HNC outcomes. Kaplan-Meier analysis with log-rank statistics assessed overall (OS) and disease-free survival (DFS), in months, among DM patients diagnosed with HNC at Roswell Park Cancer Institute (1/1/2003-12/31/2010). Metformin use improved mean OS (93.05 vs. 62.95, P=0.008) and DFS (87.08 vs. 54.55, P=0.020). Insulin use decreased mean OS (47.98 vs. 88.38, P<0.001) and DFS (33.53 vs. 83.99, P<0.001). Metformin’s addition to insulin increased mean OS and DFS by 15.17 (Raw P=0.034) and 22.43 (Raw P=0.021) months, respectively.

ACADEMIC AND CAREER GOALS: To obtain my MD degree and become a pediatrician.  
WORDS TO LIVE BY: “Failure will never overtake me if my determination to succeed is strong enough” – Unknown

Ali Al Qaraghuli

HOMETOWN: Syracuse, NY  
MAJOR: Electrical Engineering  
INTERNSHIP PLACEMENT: UB Nanosatellite Laboratory  
SUMMER MENTOR: Dr. John Crassidis  
SUMMER MENTOR TITLE: CUBRC Professor  
DEPARTMENT: Mechanical and Aerospace Engineering  

SUMMER PROJECT: Integration of Triple Junction Solar Panels in Nanosatellite Power Systems  
ABSTRACT: Throughout the electronic age, space vehicles have shaped our modern civilization and created a more connected world. Satellites are now designed to perform serious duties while hosting smaller structures. However, with smaller satellites, smaller solar cells need to be implemented, which can cause a dilemma in the case of recharging the vehicle’s battery. In order for a cell to maintain high efficiency at a small size, it must have multiple junctions. For the purposes of the UBNL Space Debris sister satellites, triple junction solar cells can provide reliable and renewable power to small satellites in order to guarantee data and command handling, in addition to recovering power lost to tumbling.

ACADEMIC AND CAREER GOALS: To obtain a Doctorate of Medicine Degree and specialize in Ophthalmology subspecializing in Oculofacial Plastic Surgery.  
WORDS TO LIVE BY: “Scientists in the Renaissance and Islamic Golden age studied various fields and pioneered in all of them, made discoveries in all of them, and left their legacies through their inventions. Now, you have one college major and one field to master, if you ever doubt that you can do it, think of how someone with the same biology as you has accomplished much more.”
Andrew Alegria

HOMETOWN: Lynbrook, NY
MAJOR: Mechanical and Aerospace Engineering
INTERNSHIP PLACEMENT: Automation, Robotics and Mechatronics Lab
SUMMER MENTOR: Dr. Venkat Krovi
SUMMER MENTOR TITLE: Professor
DEPARTMENT: Mechanical and Aerospace Engineering

SUMMER PROJECT: An Analysis of Robotic Manipulators Using Visualization and Simulation Software, as well as Analytical Examination

ABSTRACT: Robotic Manipulators consist of rigid links coupled together by articulations. Examples of such manipulators include open-chain mechanisms such as the one link, two link, three link or, closed-chain mechanisms such as the four-bar. We analyzed, simulated, and visualized how the links and end-effector moved under joint-mounted motors. Computer Aided Engineering software was used to create models for visualization and simulation of robotic systems. For our analytical analysis, we used mathematical and physics based methods initially, developing comparative models with CAE tools. However, the complexity of analytical methods increased very rapidly with an increasing numbers of links. Hence, the bulk of my work focused on the kinematics of more complex examples.

ACADEMIC AND CAREER GOALS: My most immediate goal is to obtain my Bachelor of Science in Mechanical and Aerospace Engineering in 2 years and, in the future, start my own company.

WORDS TO LIVE BY: “Impossible is just a big word thrown around by small men who find it easier to live in the world they’ve been given than to explore the power they have to change it. Impossible is not a fact. It’s an opinion. Impossible is not a declaration. It’s a dare. Impossible is potential. Impossible is temporary. Impossible is nothing.” - Muhammad Ali

Baritziga Banuna

HOMETOWN: Buffalo, NY
MAJOR: Chemical Engineering
INTERNSHIP PLACEMENT: Dept. of Chemical and Biological Engineering
SUMMER MENTOR: Dr. Marina Tsianou
SUMMER MENTOR TITLE: Associate Professor
DEPARTMENT: Chemical and Biological Engineering

SUMMER PROJECT: Investigation of Calcium Oxalate crystal morphology using additives in silica hydrogel

ABSTRACT: Calcium oxalate is the major substituent of debilitating renal stones. Calcium oxalate crystals exist in three different forms: monohydrate (COM), dihydrate (COD), and tri-hydrate (COT). COM crystals are most closely associated with the kidney stones. Additives with anionic functional groups have shown inhibitory effects on COM crystal formation. However, more research must be done to understand the underlying mechanism behind these interactions. Hydrogels serve as an analog to the biological environment in which renal stones form. Using silica hydrogel matrixes, we investigated the efficacy and effects of additives; Trisodium Citrate and PSS (Polystyrene Sulfonate) in the inhibition of COM formation and crystal morphology.

ACADEMIC AND CAREER GOALS: To obtain a Master’s degree in the field of chemical engineering and materials science. I would also like to establish a firm to promote the implementation of new technologies.

WORDS TO LIVE BY: “If I have seen further it is by standing on the shoulders of giants.” - Sir Isaac Newton
Emmanuel Cott

HOMETOWN: Buffalo, NY
MAJOR: Computer Science
INTERNSHIP PLACEMENT: Security Lab Davis Hall
SUMMER MENTOR: Dr. Shambhu J. Upadhyaya
SUMMER MENTOR TITLE: Professor, Associate Department Chair
DEPARTMENT: Department of Computer Science and Engineering

SUMMER PROJECT: Cyber Security of Social Networks (Twitter Analysis)
ABSTRACT: The spreading of information through social networks is both influential and sometimes unpredictable. Understanding how information spreads is essential for user security. In our research we will investigate and simulate how information spreads through the Twitter Network. This will allow us to detect and analyze malicious content embedded in tweets, retweets and hashtags. Afterwards, we will develop and employ cyber security algorithms and measurements to prevent or mitigate the spread of malicious content.

ACADEMIC AND CAREER GOALS: To further study the field of Computer Science and to start my own software development company.
WORDS TO LIVE BY: “This world is but a canvas to our imagination.” - Henry David Thoreau

Abdul-Malik Davies

HOMETOWN: Queens, NY
MAJOR: Chemical Engineering
INTERNSHIP PLACEMENT: Colloidal and Aerosol Nanomaterials Laboratory (CANlab)
SUMMER MENTOR: Dr. Margarita Dubocovich
SUMMER MENTOR TITLE: UB Distinguished Professor
DEPARTMENT: Chemical and Biological Engineering

SUMMER PROJECT: Synthesis of Yolk-Shell Structured Silicon-Germanium Anodes for Lithium-ion Batteries
ABSTRACT: The move towards a more sustainable world requires more efficient energy storage systems. New materials are needed to improve the storage capacity of batteries. Silicon-germanium (SiGe) alloy nanoparticles can potentially be used to create anodes with much higher specific capacity than graphite, the most commonly used material in Lithium-ion (Li-ion) batteries. However, these materials suffer from degradation due to volume expansion and contraction during use. To address this challenge, we are preparing carbon-coated SiGe-based anodes with a nanostructure that can accommodate volume changes. Starting with SiGe nanoparticles obtained using a laser reactor, we expect to achieve a SiGe@void@C yolk-shell structure utilizing mostly solution-phase techniques.

ACADEMIC AND CAREER GOALS: To work in the energy industry with a focus on sustainability-related projects.
WORDS TO LIVE BY: “Be at war with your vices, at peace with your neighbors, and let every new year find you a better man.” - Benjamin Franklin
Tanahiry Escamilla

**HOMETOWN:** Queens, NY  
**MAJOR:** Chemical Engineering  
**INTERNSHIP PLACEMENT:** School of Engineering and Applied Sciences  
**SUMMER MENTOR:** Dr. Haiqing Lin  
**SUMMER MENTOR TITLE:** Assistant Professor  
**DEPARTMENT:** Department of Chemical and Biological Engineering  

**SUMMER PROJECT:** Surface Modification on Membrane for Wastewater Treatment  
**ABSTRACT:** Water scarcity is a severe problem driving a demand for simple, energy-efficient water purification technologies. Polymeric membranes are increasingly being used to purify water, however membrane fouling results in reduction of separation efficiency and increase in maintenance and operation costs. In our research, polydopamine and 2-methacryloyloxyethyl phosphorycholine are used for the surface modification of polyethylene membranes to study its decomposition effects on the physical properties of membranes. This research will help further our understanding of membrane modifications to offer a simple and effective platform to improve fouling resistance of membranes operating at large-scale water purification facilities.

**ACADEMIC AND CAREER GOALS:** To obtain a Master of Science degree in Chemical Engineering and empower the Hispanic community to realize its fullest potential through STEM awareness, access, support and development.  
**WORDS TO LIVE BY:** “Start by outdoing yourself, and then keep on keeping on.” - Alford Antoine John

Alejandro Falca

**HOMETOWN:** Buffalo, NY  
**MAJOR:** Medicinal Chemistry  
**INTERNSHIP PLACEMENT:** Watson Research Group  
**SUMMER MENTOR:** Dr. David Watson  
**SUMMER MENTOR TITLE:** Professor  
**DEPARTMENT:** Chemistry  

**SUMMER PROJECT:** Excited-State Charge Transfer between Covalently Tethered CdSe/CdTe Quantum Dots and Mesoporous TiO$_2$  
**ABSTRACT:** Quantum dots are valuable light harvesters for solar energy conversion and photocatalysis. Semiconductor quantum dots have been studied extensively for their size-dependent optical properties as well as for their role as excitonic and trap states, which may alter charge-transfer processes. One major challenge is to maintain the separation of photogenerated charges. We synthesized a CdSe/CdTe heterostructure on TiO$_2$ films through ligand exchange in order to spatially separate electrons and holes upon excitation of light. We expect this configuration of quantum dots to minimize electron-hole recombination thus improving the odds that photogenerated electrons and holes can be used to do work.

**ACADEMIC AND CAREER GOALS:** My current goal is to make it into the Jacobs School of Medicine and Biomedical Sciences while long term I want to become an anesthesiologist.

**WORDS TO LIVE BY:** “There is a certain terror that goes along with saying, “My life is up to me.” It is scary to realize there’s no magic, you can’t just wait around, no one can really rescue you, and you have to do something.” - Meg Jay
Jarrett Franklin

HOMETOWN: Weldon Springs, Missouri
MAJOR: Electrical Engineering
INTERNSHIP PLACEMENT: Energy Systems Integration
SUMMER MENTOR: Dr. Jennifer Zirnheld; Dr. Kevin Burke
SUMMER MENTOR TITLE: Director and Associate Professor; Research Assistant Professor
DEPARTMENT: Electrical Engineering

SUMMER PROJECT: Using Software to Determine the Total Harmonic Distortion of Waveforms

ABSTRACT: Relays are electrical switches used to block current to a power system when a fault is detected. In electronics, faults are irregular changes in current that can lead to system damage. However, harmonics are waveform distortions that can mimic faults. This can lead to nuisance tripping which is the process of a relay sealing current from the system when transient signals are detected. By using software simulations these compositions can be studied to ensure proper relay performance. The ability to determine the magnitude of harmonic composition, will aid manufacturers in defining relay settings that can differentiate faults from harmonics.

ACADEMIC AND CAREER GOALS: I seek to work with a space program.

WORDS TO LIVE BY: “The difference between a successful person and others is not a lack of strength, not a lack of knowledge, but rather a lack in will.” - Vince Lombardi Jr.

Chris Gnam

HOMETOWN: Rochester, NY
MAJOR: Mechanical and Aerospace Engineering
INTERNSHIP PLACEMENT: Sound and Vibrations Laboratory
SUMMER MENTOR: Dr. Mostafa Nouh
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Mechanical and Aerospace Engineering

SUMMER PROJECT (TITLE): Vibration Control with Periodic Structures
ABSTRACT: Spacecraft optical equipment often times needs to be held extremely still while taking long exposures, and so they must somehow be kept isolated from undesirable sources of vibration (such as from reaction wheels). Materials with good damping properties, such as rubber-like and viscoelastic polymers, are typically soft with a low mechanical stiffness and are thus not always suitable. Another approach is to use periodic structures (utilizing both periodic geometries and materials) which are known to exhibit a unique structural response stemming from their ability to generate stop bands. Within these stop bands, vibration excitations of certain frequencies are incapable of producing elastic waves that propagate through the structure and are, therefore, effectively damped. We are studying various theoretical periodic structures using the finite element method using ANSYS workbench to model their filtering characteristics. We have also created mathematical models using MATLAB to predict the wave dispersion patterns of these structures which have allowed us to identify geometries with potentially powerful vibrational suppression properties, which may allow for more precise data collection on spacecraft optical systems.

ACADEMIC AND CAREER GOALS: To one day work at SpaceX or NASA to assist in the development of a permanent martian infrastructure.

WORDS TO LIVE BY: “When something is important enough, you do it even if the odds are not in your favor.” - Elon Musk
Dominique N. Hickson

HOMETOWN: Harlem, NY
MAJOR: Computer Engineering
INTERNSHIP PLACEMENT: VPML/Robotics Lab
SUMMER MENTOR: Dr. Karthik Dantu
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Computer Science and Engineering

SUMMER PROJECT: Autonomous Mobile Robot Range and Bearing Utilizing Channel State Information

ABSTRACT: Autonomous mobile robots are equipped with external status sensors to accumulate information about the environment in which it is activated. This helps the mobile robot establish its location; thus assisting the mobile robot with avoiding obstacles and providing it with a stable course navigation. With a combination of external status sensors, including ultrasonic rangers, lasers, cameras, and a global positioning system (GPS), the process of localization highly depends on each sensor’s own unique capabilities and designations. GPS receivers are able to effectively locate mobile robots in an outdoor environment using signals to communicate with satellite devices. However, GPS signals do not work indoors due to complications with penetrating through physical barriers, and cameras/lasers cannot be used to identify landmarks in new environments without prior learning. Since Wi-Fi relies on radio frequency signals from Access Points (AP), we used Wi-Fi software to calculate a mobile robot’s range and bearing which is a cost-effective strategy that requires no further hardware components. Furthermore we will design a system that measures relative range and bearing using Channel State Information (CSI), that is available with newer wireless cards and APs, to aid in localization. This can be used independently or together with other sensors to improve the accuracy and efficiency of localization of robots in indoor environments.

ACADEMIC AND CAREER GOALS: To build an organization for at risk populations in crime ridden neighborhoods that will teach them how to code in a wide variety of computer languages and control hardware.

WORDS TO LIVE BY: “We gotta make a change; it’s time for us as a people to start making some changes. Let’s change the way we eat, let’s change the way we live and let’s change the way we treat each other.” - Tupac Shakur

Anna Huang

HOMETOWN: Oakland Gardens, NY
MAJOR: Social Science Interdisciplinary - Community Mental Health
INTERNSHIP PLACEMENT: University At Buffalo School of Public Health and Health Professions
SUMMER MENTOR: Dr. Lynn Kozlowski; Dr. Gary Giovino
SUMMER MENTOR TITLE: Former Dean of the Department and Professor; Current Dean of the Department and Professor
DEPARTMENT: Department of Community Health and Heath Behavior

SUMMER PROJECT: Assessing the Pharmacotherapies of Treatments for Smoking Cessation in Adults with Serious Mental Illness

ABSTRACT: Tobacco smoking remains the leading preventable cause of death in the United States with 480,000 annual deaths. Smoking causes three out of five smokers to die prematurely. Most Individuals with serious mental Illness such as Schizophrenia and Bipolar Disease are much more likely to be cigarette smokers than individuals without mental illness. Collected copies of published literature will be reviewed in detail to try to assess the magnitude of the treatments effects, using established measures of effect-size [e.g. NNT]. Our research will help further understand the extent to which pharmacotherapy treatments will help the abstinence of smoking cessation in adults with mental illness.

ACADEMIC AND CAREER GOALS: To obtain a Master’s in Epidemiology, and to become an Epidemiologist. I also plan to work around the word, studying and preventing the diseases that are spread world wide, with regards to public health and public safety.

WORDS TO LIVE BY: “Fall down seven times, Stand up eight.”
Mohammed Karim

HOMETOWN: Queens, New York
MAJOR: Pre-Med/Biomedical Sciences
INTERNSHIP PLACEMENT: Biomedical Research Building
SUMMER MENTOR: Dr. Stewart Clark
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Pharmacology and Toxicology

SUMMER PROJECT: Characterization of a Preclinical Model of Progressive Supranuclear Palsy

ABSTRACT: Progressive Supranuclear Palsy is a neurodegenerative disease with characteristic tau protein aggregates. Currently, no animal model exists for treatment of this disease. However, we have created a rat model by infecting the cholinergic neurons of the pedunculopontine tegmentum with a virus containing a human tau gene. In this model, we believe overexpression of tau will produce deficits in motor performance. We assessed rats for their motor performance using walkways and horizontal ladders. We discovered that tau infused rats produce impairments in walking behavior. Therefore, we expect this model to be useful in finding a treatment for Progressive Supranuclear Palsy.

ACADEMIC AND CAREER GOALS: I strive to attend Medical School and obtain a Medical Doctor degree. After Medical School I intend to pursue a career in neurosurgery and potentially find a cure for Parkinson’s Disease.

WORDS TO LIVE BY: “When life knocks you down with an obstacle, you get back up. Failure is not an option.”

Jalisa Kelly

HOMETOWN: Niagara Falls, NY
MAJOR: Biomedical Sciences
INTERNSHIP PLACEMENT: Jacobs School of Medicine and Biomedicine
SUMMER MENTOR: Dr. Xiaozhong Wen, Ph.D.
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Pediatrics

SUMMER PROJECT: Changes in Knowledge and the Intent of Breastfeeding among Pregnant Smokers after Smoking Cessation

ABSTRACT: Breastfeeding rates among pregnant women who smoked are significantly low compared to pregnant women who did not smoke. Our study employs data from the UB Pregnancy and Smoking Cessation study, which uses multiple component interventions to guide pregnant smokers on the journey to quit. Survey use before and after smoking cessation; showcases the change in knowledge and intent to breastfeed in a sample size of 32 women. It is expected that the intent to breastfeed will increase amongst our sample size once educated about breastfeeding, and smoking has ceased.

ACADEMIC AND CAREER GOALS: To attend medical school and obtain an M.D, graduate and go on to be a doctor in underserved areas. Later on I also plan on becoming a clinical instructor.

WORDS TO LIVE BY: “All things are possible! The key is to identify what you want, claim it for yourself, and believe that you are worthy to have it.” – Iyanla Vanzant
Kaytlan LoCicero

HOMETOWN: Binghamton, New York
MAJOR: Social Science Interdisciplinary
INTERNSHIP PLACEMENT: School of Public Health
SUMMER MENTOR: Dr. Heather Orom, Ph.D.
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Community Health and Behavior

SUMMER PROJECT: Identifying Physicians’ Influence on Prostate Cancer Patients’ Treatment Decision
ABSTRACT: Physician recommendations may be the most important influence on men’s prostate cancer treatment decision, however there is limited data that explains under what circumstances physician’s recommendations influence treatment decisions. We conducted a qualitative data analysis of transcribed interviews with 25 prostate cancer patients who discussed their decision-making experience to examine any major themes that may reflect a strong influence in men’s treatment decision. This research will provide a better understanding of physicians’ influence on men’s treatment decision and how patient-physician relationships can reduce under and over treatment.

ACADEMIC AND CAREER GOALS: To obtain a Bachelor of Sciences in Community Mental Health and attend the University at Buffalo’s ABS Summer Nursing Program to obtain a Bachelor degree in nursing and become a registered nurse in my local community.

WORDS TO LIVE BY: “I consider that our present sufferings are not worth comparing with the glory that will be revealed in us.” - Romans 8:18

Anthony Lopez

HOMETOWN: Maybrook, NY
MAJOR: Biological Sciences
INTERNSHIP PLACEMENT: Institute of Photonics and Biophotonics
SUMMER MENTOR: Dr. Hilliard Kutscher
SUMMER MENTOR TITLE: Research Assistant Professor
DEPARTMENT: Chemistry

SUMMER PROJECT: Formulation of Biodegradable Nanoparticles for the Treatment of Tuberculosis
ABSTRACT: Tuberculosis is considered as a menacing epidemic that continues to plague 9.6 million lives globally. Treatment requires constant uptake of antibiotics over long periods of time. Nanoparticles remedy this offering systemic drug distribution and improve intracellular drug concentration. Rifampin loaded poly (lactic-co-glycolic acid) [PLGA] nanoparticles were synthesized via a water-oil-water emulsion technique. Lamentably nanoparticle TB treatment suffers from low encapsulation efficiency and burst release. Therefore this study will manipulate polymer composition to evaluate the consequential effects observed on nanoparticle size, zeta potential, release rate and encapsulation efficiency. We hope to find composition which maximizes rifampin loading and steady drug release.

ACADEMIC AND CAREER GOALS: I hope to obtain a Medical Degree and specialize in Cardiothoracic surgery. Additionally I aspire to work on reform in medical care for Puerto Rico and the inner cities of the United States. Lastly, I wish to clinically study cardiovascular diseases in my latter age.

WORDS TO LIVE BY: “When life knocks you down, try to land on your back. Because if you can look up, you can get up.”
Jillian Naylor

HOMETOWN: Mandeville, Jamaica
MAJOR: Biological Sciences
INTERNSHIP PLACEMENT: Biological Sciences
SUMMER MENTOR: Dr. Kathryn Medler
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Biological Sciences

SUMMER PROJECT: Investigating the role of BASP1 on taste cell maintenance

ABSTRACT: Taste receptor cells are specialized neuroepithelial cells that are housed in taste buds in the lingual epithelium of the oral cavity. Due to their exposure to the external environment, taste cells are vulnerable to damage. To compensate for any damage, taste cells are constantly being replaced. However, the mechanisms that control this turnover process are not well understood. While there are many proteins found in the peripheral taste cells, it is unclear which contribute to taste cell maintenance. One potential protein that may be involved is the transcriptional regulator, Brain Acid Soluble Protein (BASP1). Experiments using Polymerase Chain Reaction (PCR) and immunohistochemical analyses are aid in better understanding the role of BASP1 in taste cell maintenance.

ACADEMIC AND CAREER GOALS: To become an endodontist and to open a clinic in my hometown in Jamaica.
WORDS TO LIVE BY: “If God leads you to it, He will guide you through it.”

Aaron Nimako

HOMETOWN: Buffalo, NY
MAJOR: Biomedical Science
INTERNSHIP PLACEMENT: Roswell Park Cancer Institute
SUMMER MENTOR: Dr. Jerome Yates; Dr. Richard Cheney
SUMMER MENTOR TITLE: Research Mentor
DEPARTMENT: Pathology

SUMMER PROJECT: Analysis of Cholangiocarcinoma in Roswell Park Autopsy Database

ABSTRACT: From 1950-1987, over 23000 autopsies were done at RPCI. Cholangiocarcinoma is a relatively rare cancer and usually results in death for the patient. It arises in the bile ducts draining the liver or throughout the extra hepatic ducts. Using the autopsy files, demographic characteristics of patients with Cholangiocarcinoma were collected. Sex, age, survival, risk factors and other cancer diagnosis were collected. 20234 records were scanned and 11 cases of Cholangiocarcinoma were found. There were 3 males and 8 females ranging from ages 39 to 68. Their survival ranged from 3 weeks to 5 years. This remains a very difficult cancer to control and etiologic factors contributing to its genesis are largely obscure.

ACADEMIC AND CAREER GOALS: I want to obtain my MD, followed by being a physician.
WORDS TO LIVE BY: “If you believe in god, then one thing is for sure. If you don’t aim too high, then you’ve aimed too low.”
Lee-Mary Amara Njoku

HOMETOWN: West Hempstead, NY  
MAJOR: Biomedical Sciences  
INTERNSHIP PLACEMENT: Jacobs School of Medicine and Biomedicine  
SUMMER MENTOR: Dr. Omer Gokcumen  
SUMMER MENTOR TITLE: Professor  
DEPARTMENT: Biological Sciences  

SUMMER PROJECT: The Evolution of the LCE3BC Deletion in Modern Humans and its Relationship with Psoriasis  

ABSTRACT: An ancient 32kb deletion of the genes LCE3B and LCE3C is heavily associated with psoriasis. Data proves this deletion survived in extant populations for allowance of autoimmunity through increased pathogen exposure. Although the genomic variations of the individuals (obtained from the 1000 Genomes Project) are likely precise, there is a slight possibility of errors in the deletion genotypes. Digital Polymerase Chain Reaction (dPCR) followed by gel electrophoresis and computer analysis will be done to compare the haplotypes (DNA sequences) of the individual’s genotypes from the 1000 Genomes Project with the ones obtained from the dPCR to validate the former dataset.

ACADEMIC AND CAREER GOALS: To attend medical school and become a plastic surgeon.  
WORDS TO LIVE BY: “When everything in life turns upside down, remember that you are in the hands of the Creator. Look to God, and you’ll always know which way is up.” - Unknown

Ndidiamaka Okorozo

HOMETOWN: Queens, NY  
MAJOR: Biomedical Sciences  
INTERNSHIP PLACEMENT: Jacobs School of Medicine and Biological Sciences  
SUMMER MENTOR: Dr. Shermali Gunawardena, Ph.D.  
SUMMER MENTOR TITLE: Professor  
DEPARTMENT: Biological Sciences  

SUMMER PROJECT: The Effect of Huntingtin on Rab2 Localization in the Axons  

ABSTRACT: Huntington’s disease (HD) is a neurodegenerative disease which causes loss of motor coordination and leads to premature death. Huntingtin (HTT), the protein which causes HD, is enriched in neurons and likely functions in axonal transport. Recently, our lab showed that HTT regulates the transport of the protein Rab2 in Drosophila axons and that HTT and Rab2 move together during axonal transport. Rab2 traffics vesicles between the endoplasmic reticulum (ER) and Golgi. Using markers for ER, we examined how HTT affects the ER in Drosophila axons. We expect that reduction in HTT levels or expression of mutant HTT perturb ER localization in axons.

ACADEMIC AND CAREER GOALS: To obtain a dual degree in Medicine and Business Administration (MD/MBA).  
WORDS TO LIVE BY: “Confidence comes from overcoming your challenges and not from avoiding them. So if you are going through hell, KEEP going.” - Unknown
Iyamu Osazuwa

HOMETOWN: Newark, New Jersey
MAJOR: Electrical Engineering
INTERNSHIP PLACEMENT: Energy System Integration
SUMMER MENTOR: Dr. Jennifer Zirnheld; Dr. Kevin Burke
SUMMER MENTOR TITLE: Director and Professor; Research Assistant Professor
DEPARTMENT: Electrical Engineering

SUMMER PROJECT: Effects of Harmonics on Digital Realays

ABSTRACT: Protective relaying plays an important role in power system stability. The goal of this research will be to program a relay enabling a correct response to different inputs. Relays are electromechanical switches that provide electrical isolations of variable components in a power system. Accurate detection of unwanted anomalies in fault waveforms is critical in relay performance. Whenever a transient or over-specification waveform is detected, relays trip off. A software simulation is used to detect and extract harmonics from a signal. The extracted data was used to calculate the total harmonic distortion (THD), thus predicting the signal’s behavior. With the extracted data, the relay can be programmed to accommodate for harmonics to reduce power loss that can eventually lead to system failure.

ACADEMIC AND CAREER GOALS: To obtain a Masters degree in Electrical Engineering and then work in a power industry.
WORDS TO LIVE BY: “Try not to become a person of success, but rather try to become a person of value.” - Albert Einstein

Lucas Rugar

HOMETOWN: Centereach, NY
MAJOR: Civil Engineering
INTERNSHIP PLACEMENT: Department of Civil, Structural and Environmental Engineering
SUMMER MENTOR: Dr. Pinar Okumus
SUMMER MENTOR TITLE: Assistant Professor
DEPARTMENT: Civil, Structural and Environmental Engineering

SUMMER PROJECT: Determining Bridge Characteristics Causing Adverse Effects on Bridges with High Skew

ABSTRACT: This research investigates a relationship between skew angle and bridge condition, considering the effects of other bridge characteristics. A bridge database was compiled from the inventory of the Wisconsin Department of Transportation (WisDOT). Statistical analysis methods are being employed to find possible correlations between skew angle and bridge performance, paying extra attention to bridge characteristics such as deck aspect ratio and bearing type. Bridge performance is evaluated based on ratings and observations from inspections. Immediate results show that interaction of bridge characteristics with skew should be considered to find strong correlations. This research will help understand if, and when, skew should be considered in analysis and design.

ACADEMIC AND CAREER GOALS: To obtain an M.S. in construction management and open my own engineering firm.
WORDS TO LIVE BY: “Always work hard on something uncomfortably exciting.” - Larry Page
Diamile Tavarez

**HOMETOWN:** Ridgewood, NY  
**MAJOR:** Biological Sciences  
**INTERNSHIP PLACEMENT:** Biomedical Research Building  
**SUMMER MENTOR:** Dr. Zhen Yan  
**SUMMER MENTOR TITLE:** Professor  
**DEPARTMENT:** Physiology & Biophysics

**SUMMER PROJECT:** *Investigation of Potential Therapeutic Treatment for Autism Spectrum Disorders Using Histone Deacetylase Inhibitors*

**ABSTRACT:** Autism spectrum disorders (ASDs) are a group of developmental disabilities that cause difficulties in social interactions and other behaviors. Previously, Shank3 haploinsufficiency was identified as an autism risk factor that disturbs neuronal communication. Epigenetic studies have found the genes disrupted in autism to be histone modifying enzymes. In this present investigation, we intend to use Histone Deacetylases (HDACs) inhibitors to determine if it can serve as a potential form of treatment. We will apply HDACs inhibitors to Shank3-deficient mice and conduct various behavioral assays to determine if mice still exhibit autism-like behaviors. This research will not only further our understanding of autism- but also provide a possible treatment for autism.

**ACADEMIC AND CAREER GOALS:** To obtain a Ph.D. in Biological Sciences with a focus on genetics, genomics, and bioinformatics. Once I complete my Ph.D., I plan to continue conducting research and become a mentor to undergraduate and graduate students.

**WORDS TO LIVE BY:** "If you don’t like something, change it. If you can’t change it, change your attitude. Don’t complain.” -Maya Angelou

Douglas Tsahey

**HOMETOWN:** Albany, NY  
**MAJOR:** Biomedical Science  
**INTERNSHIP PLACEMENT:** Translational Research  
**SUMMER MENTOR:** Dr Richard Rabin  
**SUMMER MENTOR TITLE:** Professor  
**DEPARTMENT:** Pharmacology and Toxicology

**SUMMER PROJECT:** *Effect of Alcohol on Microglial Cell*

**ABSTRACT:** Microglial cells are immune cells of the brain, which are involved in protecting nervous system from foreign treats, damages and infections. Microglial cells do this via phagocytosis. Phagocytosis involves ingesting cellular debris, and other foreign substance which are considered harmful and neutralizing them. Studying the effects of alcohol on the phagocytic process is important because of the wide spread use across the population. Fluorescent beads will be used to measure the level of uptake in cells after exposure to alcohol. This will help better understand what effect increased alcohol consumption will have on the cells. Results obtained from this experiment can be applied to understanding how alcohol use affects early stages of neurodegenerative disorders such as Multiple Sclerosis.

**ACADEMIC AND CAREER GOALS:** To go to medical school and to become a doctor.

**WORDS TO LIVE BY:** “Aspire to be great.”
The 2016 CSTEP Summer Research Program expresses thanks and appreciation to the following workshop & tour facilitators for their contributions & support:

**STEPHANIE ADAMS, ESQ.**  
GENERAL COUNSEL, NIAGARA UNIVERSITY

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DEAN, SCHOOL OF ARTS, SCIENCES, AND EDUCATION, D’YOUVILLE COLLEGE

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MAP LIBRARIAN, SCIENCE AND ENGINEERING INFORMATION CENTER

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DIRECTOR, BLACKSTONE LAUNCHPAD

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COORDINATOR, FELLOWSHIPS & SCHOLARSHIPS

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MARKETING CAPTAIN, OF THE SEA, LLC

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**TOM MURDOCK**  
MANAGER, UB INCUBATOR NETWORK

**DR. CELESTE OWENS**  
CLINICAL PSYCHOLOGIST, AUTHOR

**RHONDA REID**  
ASSOCIATE DIRECTOR, CENTER FOR EXCELLENCE IN WRITING

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CAREER SERVICES ASSOCIATE, CAREER SERVICES

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DISTINGUISHED TEACHING PROFESSOR, STONY BROOK UNIVERSITY

**DR. CHRISTINE TINNESZ**  
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DIRECTOR OF CENTER FOR UNDERGRADUATE RESEARCH & CREATIVE ACTIVITIES

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PHOTOGRAPHER

**A. BEN WAGNER**  
LIBRARIAN, SILVERMAN LIBRARY

**OLIVIA WEST**  
MONEY MANAGEMENT, WEST ADVISORY GROUP

**LINDA ZILGME**  
DIRECTOR, ACADEMIC RESOURCE CENTER
THANK YOU to our 2016 CSTEP Summer Symposium Judges!

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<td>Theresa</td>
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CSTEP
2016 Summer Research Program Staff

Shanna Crump-Owens
CSTEP Director

Patricia “Tia” Greer
CSTEP Administrative Assistant

Lavone Rodolph
Research Methods Course Instructor
Doctoral Student, Computer Science & Engineering

Graduate Assistants
Ruth Cadet
Nelson Rivera

Student Assistants
Shawn Gibson
Folake Olaleye

CSTEP acknowledges the support of Cora P. Maloney College (CPMC), IDC, SLCE, UB Career Services and all other University at Buffalo faculty, volunteers, workshop facilitators, staff, and students whose contributions made the 2016 Research Summer Program a grand success!
SAVETHEDATE

Join us as we celebrate and reflect on 30 years of fostering exemplary achievements among students pursuing STEM, Allied Health & the Licensed Professions

What: Fundraiser with CSTEP
Where: HARBORCENTER
100 Washington Street, Buffalo, NY 14203 - “Canalside”
When: Friday, May 19th, 2017
Time: 6:00pm

QUESTIONS? Contact the CSTEP Office:
222 Norton Hall - Buffalo, NY 14260 - (716) 645 - 2234
You can also email Shanna Crump-Owens, Director, at sicrump@buffalo.edu
CELEBRATING 30 YEARS OF SUCCESS

CSTEP IS HITTING THE ROAD!

join us for a Service Trip to TANZANIA

[DURING EXPERIENTIAL LEARNING COURSE, YOU WILL...

• Visit community development projects, clinics, and schools
• Engage with local villagers, community leaders, and educators
• Go on a guided safari through the famed Serengeti Game Preserve

BENEFITS INCLUDE:

3cr. Study Abroad (UE 496) - Faculty-led service learning - Navigate the Mara Region - Experience another culture

WHAT YOU WILL NEED:

Must be a currently enrolled CSTEP student - Passport

DEPOSIT DUE BY WEDNESDAY, SEPT. 28, 2016

Explore community development through 4 key areas: EDUCATION, HEALTH, ECONOMICS, & INFRASTRUCTURE

For information, please visit us in:
222 Norton Hall • 716-645-2234 • cpmc.buffalo.edu/cstep
Study Abroad website: buffalo.edu/studyabroad.html
Buffalo Tanzania Education Project (BTEP) website: buffalotanzania.wordpress.com
2016 CSTEP SUMMER RESEARCH INTERNS

2016 CSTEP Research Interns Fieldtrip to Hauptman-Woodward Institute (HWI)