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I am delighted to serve as the Collegiate Science Technology Entry Program (C-STEP) Director at the University at Albany.

There is a need for the world to produce more scientifically and technically trained individuals. C-STEP program, funded by the New York State Department of Education, is one of the ways in which the University is providing support in cultivating the academic talents of underrepresented populations to help meet this need. The technical employment market and STEM fields are still careers experiencing growth domestically and abroad. We want to encourage as many undergraduates as possible to be prepared for the available opportunities in these industries as well as the professoriate.

C-STEP is a comprehensive effort to encourage underrepresented students to pursue their interest in related science careers, as well as licensed professions. Our C-STEP includes the following services: supplemental academic advisement; personal counseling; career planning; financial planning and information; culturally enriching activities; peer mentoring; faculty mentoring; study skills workshops; instruction in pre-college math and science; individual tutoring; study group programming; professional and graduate school preparation; cultural, professional and educational field trips to local industries; and an extensive summer research experience for approximately 15 students. Felicia Collins, University at Albany C-STEP Coordinator, regulates these services.

I am extremely pleased with the unique partnership opportunity of students, faculty and the Albany community in supporting the development of our C-STEP. It is this kind of commitment and cooperation which we need to assist us with our goals of producing more trained scientists, physicians, lawyers and educators. Our research placements are at diverse locations, including various departments at the University at Albany, Gen*NY*Sis Center for Excellence in Cancer Genomics, College of Nanoscale Science and Engineering, Pharmaceutical Research Institute, the New York State Health Department’s Wadsworth Center, and the Stratton Veterans Administration Medical Center.

I’d like to take this opportunity to thank the many faculty members who gave their time and expertise in order to provide our C-STEP program scholars with a research experience that will help them prepare for the rigors of graduate school and beyond.

Sincerely,

Dr. Christopher Fernando
C-STEP Director
I am delighted to present the University at Albany Summer Research Journal. The University at Albany Summer Research Program continues to grow each year, which has made the selection process more difficult.

The journal is a tribute to our 17 scholars who worked extremely hard this summer, along with our dedicated faculty mentors who gave of their time and attention to mentor our scholars. Their commitment to our program has made the program what it is today. For eight weeks scholars worked in various research labs; for some it was their first time. The students profiled in this journal have worked hard and have obtained new skills. Many are now interested in pursuing a Ph.D. in their chosen field of study. The journal represents their scholarly endeavors, academic excellence, and future professional goals.

I congratulate our scholars on a job well done. They have performed with a sense of purpose driven by curiosity. Some hope to discover a cure for cancer or do other research that would have a strong impact on the world. Each of these students, I believe, will make a difference in the world. They are truly scholars.

I would like to take this opportunity to thank our faculty mentors, AGEP, CSTEP, LSAMP and so many others who have gone beyond the call of duty to promote research within the STEM fields. This program would not be successful if it were not for your commitment to our mission.

Sincerely,

Felicia Collins
Program Coordinator CSTEP UASRP and LSAMP
Comparative Anticoagulant Activity of Direct Versus Indirect Anti-Xa

Factor Xa in the coagulation cascade activates thrombin, which in turn catalyzes the formation of fibrin. Anticoagulants reduce the blood’s ability to form fibrin clots. Two anticoagulants are Rivaroxaban, taken orally, and Fondaparinux, administered through subcutaneous bolus injection. Rivaroxaban directly inhibits Xa activity while Fondaparinux indirectly inhibits Xa activity. A safe anticoagulant has a large therapeutic window and can prevent thromboembolism by delaying clotting time without causing excessive bleeding. The clotting times of different concentrations of each anticoagulant were measured using the Activated Partial Thromboplastin Time Test with fibrometers. A comparison of their potency, efficiency, and safety margin can influence their future use in patients.

Future Goals: UASRP provided me with an invaluable research experience that taught me important laboratory skills as well as helped me grow personally. Upon receiving my Bachelor’s degree in Biology, I would like to attend medical school and later specialize in internal medicine.
Monitoring Real Time Reactive Oxygen Species (ROS) Production using Redox Sensing Green Fluorescent Protein (RoGFP)

A redox-sensitive variant of green fluorescent protein (RoGFP) is a unique protein sensor used to visualize Reactive Oxygen Species (ROS) in living cells. To study the effects of ROS, we use mouse alveolar macrophages and human cancer cells models. RoGFP is a modified form of GFP, which makes it sensitive to physiological changes of intercellular ROS. ROS has been shown to play an important role in various types of cellular signaling in infection and cancer pathologic. Monitoring ROS in real-time can prove to be vital to understanding cellular functions associated with these pathologies.

Future Goals: After completing my undergraduate education, I plan to go to medical school and specialize in emergency medicine. In the future, I plan on participating in Doctors Without Borders to help develop Third World countries in the hopes of inspiring others around the world.
Separation of Myocilin Protein from Bovine Aqueous Humour by iso-electric focusing using the MicroRotofor

The focus of this research is to isolate Myocilin protein from Bovine Aqueous Humour (BAQ) for further characterization. A MicroRotofor was used to separate BAQ proteins based on pi values into 10 fractions. Absorption spectra were used to select fractions containing protein. As a result, fractions 3 - 7 showed absorption spectra with max around 280 nm. Selected fractions were further monitored using SDS-PAGE. SDS-PAGE showed bands around 50 kDa, suggesting that Myocilin was present, and that the MicroRotofor successfully separated BAQ. Western blotting is ongoing to confirm if the 50 kDa protein bands are indeed Myocilin.

Future Goals: This summer I had the privilege to participate in the UA Summer Research Program, sponsored by CSTEP. I can’t imagine having spent my summer any other way. I plan to continue pursuing my dreams to go to medical school. This program has not only inspired me, but given me the extra push I needed.
Genomic Analysis of Circadian disruption in breast cancer cell

Although the causes of breast cancer are not known, some factors, such as night shift work, have been shown to increase a woman’s risk of developing it. Consistent exposure to light during the night disrupts their Circadian rhythm. Our work suggests that two circadian regulatory genes, “Clock” and “Timeless”, may be more active in breast cancer. We will use Rnai to reduce the expression of these genes and test whether these genes are truly important in breast cancer cells.

Future Goals: I will continue doing research throughout the academic year as well as in the summer. I also plan to pursue a master’s degree in the biological sciences after my undergraduate career. I then plan to attend medical school and pursue my dream of becoming a pediatrician.
Pseudomonas is a Gram negative opportunistic microorganism which affects the respiratory tract of Cystic Fibrosis patients and the wounds of burn victims. P. aeruginosa readily forms biofilms and has 2 distinct quorum sensing based pathways (lasI/R and rhII/R). Both quorum sensing and biofilm formation by P. aeruginosa contribute to resistance and thereby increase pathogenicity. In this effort we focus on screening of small, naturally derived compounds that can inhibit biofilm formation and quorum sensing by P. aeruginosa. We further seek to determine the effects of growth conditions on the potential inhibitory activity of these compounds.

**Future Goals:** In the future I see myself practicing pharmacy in a non-traditional setting. Now that I have been introduced to the world of research, more specifically nanotechnology I also see myself pioneering some innovative drug delivery system. The University at Albany Summer Research Program has definitely been a growing experience for me. I have learned so much about myself, my career, and different people. I learned patience and as well as how to persevere, even when things aren’t what you might have initially expected.
Micro RNA – Mediated Gene Expression Control

The regulation of gene expression is critical to the health of living cells. MicroRNAs and RNA-protein interactions are two important RNA-based mechanisms to control the expression of genes, and the interplay between these mechanisms is under investigation. In our study, the B6 mRNA is expected to bind to the histone stem-loop binding protein, but only in the presence of the T2 microRNA. If our biophysical experiments examining these RNA-RNA and RNA-protein interactions are consistent with this hypothesis, we will demonstrate another level of complexity in the regulation of genes which can be investigated as an opportunity for therapeutic intervention.

Future Goals: In the near future I would like to attain an MD/PhD in the field of pediatrics and epidemiology. The UASRP program was a great experience because it was an insightful and premiere experience in research. The program also allowed me to gain the necessary professional growth I needed to pursue my academic endeavors.
The Effects of Nucleofection Buffer on K562 Cell Viability

When performing nucleofection, our laboratory team found that K562 cells exposed to the SF cell line buffer for longer periods of time had an overall lower expression of the luciferase proteins after a period of four hours. We suspected that exposing the line of K562 cells to a nucleofection buffer for extended periods of time affected either cell viability, or the internal translation mechanisms of the cell. Through the use of Trypan blue labeling, we found that incubating the cells in buffer for different time periods did not have an effect on the percent cell viability of the samples. However, we are still conducting experiments such as PCR and Western Blotting to detect if incubation in the buffer affects protein translation mechanisms in the exposed cells.

Future Goals: My future goal is to successfully finish my undergraduate career strong and potentially go on to attend medical school.
This study provides an efficient method for incorporation of Pentafluorosulfanyl (SF5) substituent into aliphatic compounds. SF5 is incorporated in alkyl enol ethers by radical addition of SF5Cl at low temperature with BEt3 catalysis. SF5-vinyl ether was synthesized by elimination under basic conditions. Using cationic polymerization techniques, an oligomeric reaction product was formed. Aldol reactions at the alpha-carbon next to the SF5-group were investigated under BF3, Et2O and BCl3. The alpha-carbon reactivity is reduced due to the high electronegativity and bulky nature of SF5. The reactivity of the beta-carbon of SF5-containing imine was also examined.

**Future Goals:** My future goal is to get an MD/PhD in biochemistry and pursue a career in medicine. After completion of my studies I plan to return to my home country of Nepal, to serve in a rural area as a physician.
Circadian rhythm, which is regulated by the suprachiasmatic nucleus in the brain, is the internal clock that affects many biological processes. Critical to normal metabolism, disruption of the circadian cycle is thought to impact diverse pathogenic conditions including tumorigenesis. The core circadian gene, mPER2, is expressed within individual SCN neurons and modulates circadian oscillations. In this study, a transfected reporter is developed by using a mPER2 plasmid containing promoter downstream green fluorescent protein to monitor rhythms in HEK 293 cells. We plan to further examine whether disruptions of circadian rhythm occur in breast cancer cells.

**Future Goals:** My future goal is to attend medical school specializing in emergency medicine or anesthesiology. After conducting research through the UASRP, I’m also considering to pursue a MD/PhD.
Prevalence of Atherosclerosis in Underrepresented Communities and the Developing Applications within Nanomedicine for Non-invasive Diagnosis and Treatment

Relatively recent advances in science and technology have revolutionized the medical field. These developments paved the way for a new medical discipline known as nanomedicine. Nanomedicine is the ability to manipulate matter on an atomic and molecular level, creating the potential for non-invasive medical applications such as advanced targeted drug delivery, medical imaging, and diagnostic sensors. Arterial plaque buildup, also known as atherosclerosis, is a common blood vessel disorder which often contributes to the narrowing and degeneration of the arteries, abdomen and extremities. It is estimated that in 15 years the leading cause of death globally will be cardiovascular heart disease. Using emerging applications within nanomedicine, a comprehensive plan of action, including diagnosis, treatment, and preventative care, will be developed for a West African patient with symptoms that resemble cardiovascular heart disease.

Future Goals: In the future, I hope to enter medical school and pursue a medical degree with a specialization in emergency medicine. I take great pride in knowing that I was a part of the prestigious summer scholar internship program at the University at Albany and more specifically I am grateful for the research experience I gained while interning at the College of Nanoscale Science & Engineering. This summer research experience has provided me with a several qualities that will remain with me: dedication, persistence and determination. It is for that reason that I am able to fearlessly pursue my future career endeavors.
Hyaluronan synthase II in the skin tissue of mice

Previous microarray data has shown the Has2 gene to be regulated by vitamin D in murine mammary cancer cells. Overexpression of Has2 is also responsible for the wrinkly skin phenotype in shar-pei dogs. Because our vitamin D receptor (VDR) knockout (VDRKO) mice show a similar skin phenotype, we are investigating how VDR alters Has2 gene expression in the skin tissue of mice. Has2 is the rate-limiting enzyme in the synthesis of hyaluronic acid (HA), so by staining skin tissue from wildtype and VDRKO mice for Has2 and HA, we are examining the effects of Has2 expression on HA by microscopy.

Future Goals: My future goal is to finish my undergraduate degree and go to medical school. I also plan to pursue a career as a pediatrician or a pathologist. By pursuing my career goals, I will ultimately help to cure diseases and help sick patients.
Effectiveness of Therapy and Symptom Reduction for Returning Veterans of Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn

Returning Veterans from the Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) conflicts, that have been exposed to combat theatre, will have varying levels of Post-Traumatic Stress Disorder (PTSD). This research will address variables associated with system utilization and treatment intensity. The project will identify components of patient care that contribute to improvement in their mental health symptoms, as determined by changes in their Post Traumatic Stress Disorder Checklist (PCL) scores. Effectiveness of therapy and symptom reduction will be correlated with identified variables, to provide predictive factors that contribute to successful outcomes.

Future Goals: Under the mentorship of Paul Postiglione, I have opened up to the idea of a future career in social work. My goal is to receive a master's in social work and work within the community where I believe my skills and perseverance will inspire growth.
Advancements in technology have enabled access to large amounts of data about various networks, such as social, transportation, communication, and citation networks. Finding a certain number of most central entities in these networks and analyzing their influence on others are essential in many applications, including national security, marketing, sociopolitical science, and communication network management. The goal of this research is to develop and evaluate techniques for finding the most central entities in large networks. By using these techniques with real-world datasets, we will find the most influential articles and scholars in several research fields, and crucial users on Twitter.

**Future Goals:** Being a UASRP scholar has helped me to consider graduate school, see the importance of research and how much of an impact research has on the world. In the future I would like to continue conducting research, pursue a Master’s and Doctorate degree. Accomplishing these goals will help me to become a role model to future minority females in Computer Science.
Comparative Anti-Coagulant Activity of Direct vs. Indirect Anti-Thrombin

Venous thromboembolism (VTE), deep venous thrombosis (DVT) and pulmonary embolism (PE) are serious conditions that can be fatal to patients. Many drugs have been developed to minimize the effects of these diseases. Argatroban and Enoxaprin are anti-coagulant drugs that directly and indirectly, respectively, inhibit the activity of factor IIa in the coagulation cascade. In this comparative study, both drugs were used to determine which had a safer therapeutic margin. The Activated Partial Thromboplastin Time (aPTT) of human plasma was measured with BBL fibrometers to determine which was more effective in vitro in preventing thrombotic processes.

Future Goals: In the future, I hope to go to medical school in hopes of pursuing a MD/PhD. UASRP has helped me grown in ways before unimaginable. I was able to learn things about the kind of person I am and who I want to be in the future.
Modeling Impact of BRCA1 And BRCA2 Mutations In Mammary Epithelial Cells

BRCA1 and BRCA2 are tumor suppressor genes that, when mutated, cause a 50%-87% increase in lifetime risk of breast cancer, accounting for 5% of breast cancer cases in the US. Because the pathways by which BRCA gene mutations cause breast cancer are not well understood, preventative treatment options for women with BRCA mutations are limited to full mastectomies. The purpose of this project is to understand how mutations in BRCA 1 and BRCA2 change their effectiveness in DNA repair, which will lead to increased treatment options for BRCA mutations carriers.

Future Goals: In the future I wish to pursue medical surgery. I would also like to conduct research; I love the brain and would love to participate in neuroscience research. UARSP allowed me to get a realistic feel for working in a cell biology laboratory. This experience confirmed my love for research and reignited my passion for scientific inquiry. The experience I gained over the summer forced me to be more confident and therefore more effective and also assisted in refining my career goals.
Effectiveness of Therapy and Symptom Reduction for Returning Veterans of Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn

Returning Veterans from the Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) conflicts, that have been exposed to combat theatre, will have varying levels of Post Traumatic Stress Disorder (PTSD). This research will address variables associated with system utilization and treatment intensity. The project will identify components of patient care that contribute to improvement in their mental health symptoms, as determined by changes in their Post Traumatic Stress Disorder Checklist (PCL) scores. Effectiveness of therapy and symptom reduction will be correlated with identified variables, to provide predictive factors that contribute to successful outcomes.

Future Goals: Upon graduating I hope to be accepted into the MPH program. After earning my MPH degree I anticipate going to Medical School to become a General Practitioner and eventually open a clinic that provides quality patient care in an underrepresented community.
Purification and Characterization of the Cataract-Associated Mutant, W156X of Human Gamma-D Crystallin Protein (HGD)

In cataracts, the proteins in the eye lens form aggregates which causes light scattering. HGD is present in high concentrations in the human lens. We expressed its cataract-associated mutant, W156X, in E.coli and used Arginine (Arg), and a chemical chaperone, sodium phenylbutyrate (4-PBA) to purify W156X and determine if it can be refolded and solubilized for further study. After W156X expression in E.coli, the insoluble fraction was collected and processed using Arg and 4-PBA. SDS-PAGE analysis showed that Arg and 4-PBA remove impurities from the insoluble fraction. This method can be used to effectively enrich the pellet fraction in W156X.

Future Goals: In the future, I see myself working for a PhD in an analytical chemistry, biochemistry or immunology based laboratory. UASRP has given me a fruitful experience and opened many doors to opportunity.
MISSION STATEMENT

To expand the horizons of the mind in science, technology, and other Ph.D. fields through research and scholarly activities.