BROTHER AUBERT HARRIGAN C.S.C.

Science Research Program 2018



HOLY CROSS HIGH SCHOOL 26-20 FRANCIS LEWIS BOULEVARD FLUSHING, NEW YORK 11358

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This Evening's Events

Student Poster Presentations

Welcome Mrs. Cathy Kenny, MPH

Science Department Chair & Science Research Coordinator

Opening Prayer

Dinner is served

Student Presentations

Dr. Anthony Paratore'00

Program Advisor

Concluding Remarks

SCIENCE RESEARCH PROGRAM



Mrs. Cathy Kenny, MPH Science Department Chair & Science Research Coordinator

The Science Research Program at Holy Cross High School was started in the fall of 2006 with a class of four sophomore students and the help and support of Mr. James Harden, Class of 1969.

Science Research in the High School is a college course that is affiliated with the State University at Albany. During the three years that the student is involved in the program, they will be researching a topic of their choice with an outside mentor at a science related institution. This institution could be a hospital, laboratory or university campus. The student, under the guidance of their mentor, designs a science research project that they will work on throughout the three years of the course. The end goal of the program is to be able to enter the student's project into one of the national science research competitions or to have a research paper published.

Throughout the years, our students have researched topics such as cancer, heart disease, gene sequencing in kidney disorders, ballistics, and autism just to name a few. They have worked at Memorial Sloan-Kettering Cancer Center, Lenox Hill Hospital, Columbia University, Manhattan College, Columbia Medical Center, and New York Institute of Technology. Our alumni have attended Sienna College, the University of North Carolina, Fairleigh Dickenson College, Saint John's University, New York University and Fordham University. Holy Cross High School is very proud of all that our students have accomplished over the years! One of the great features of our program is the extent to which our students work together as a community. As our seniors move on to new and exciting challenges, I wish them much success and happiness. I hope that their experiences in the Holy Cross High School Research Program will serve them well in their future studies and careers. I hope that they will look back fondly on the time that they spent in our program!

SCIENCE RESEARCH PROGRAM ADVISOR

Dr. Anthony Paratore Program Advisor



Dr. Anthony Paratore graduated from Holy Cross in 2000. He received his Bachelor of Science in Biology from St. Francis College in 2003 and his Masters Degree in Molecular-Cellular Biology from Long Island University in 2006. In May 2015, he received his Doctorate in Biology from Saint John's University. Dr. Paratore was on the Holy Cross Board of Directors from 2008-2014 and has been advisor to the Science Research Program since 2013. Currently, he is an Adjunct Assistant Professor at Long Island University, New York University PolyTechnic School of Engineering, and in the Community University New York system. Dr. Paratore lives in Long Island City with his wife, Ornela and daughter, Adria.



CLASS OF 2018 ANTONIO ARGUDO



My research project focuses on how to convert different computer languages. I have been researching how to convert ASCII language to Integer as well as Integer to ASCII.

Converting the text "BE HC" into binary

Characters:	В	Е		Н	С
ASCII Values:	098	101	032	104	099
Binary Values:	01000010	01000101	00100000	01001000	01000011
Bits:	8	8	8	8	8

CLASS OF 2018 MARCO GHIOZZI

The main topic of my research has been DNA targeting and cutting. The research has been to find three different systems that accomplish this DNA targeting. The first type, Type I systems use complexes for DNA targeting. These Type I systems use the "Cascade Method". Type II systems use Cas9 for DNA targeting. This is a single large protein and not a complex. Finally, Type III uses complexes for DNA/RNA targeting. They are different from the "Cascade Method". There has been evidence of RNA cutting from the Type III system supported by research conducted at other research facilities.





Unparalleled DNA-targeting Excellent Hoogsteen discrimination High 3'-exonuclease stability

C5-Functionalized LNA

CLASS OF 2018 THEO KARANIKOLAS



Last year at symposium, I presented a clinical trial I had designed under the mentorship and guidance of Dr. Debra Mangino, DO, on the subject of how breast cancer risk affects anxiety levels in women at high risk for developing breast cancer. Patients may qualify for increased risk due to family history of breast cancer or the presence of a condition such as LCIS (lobular carcinoma in situ), wherein abnormal cells begin to grow in the lobules of the breast. Along with knowledge of this, factors such as a relatively intensive screening process and medications with unwanted side effects can lead to higher levels of anxiety. It is thus necessary to ensure patient anxiety does not increase as a result of treatment. Due to a lack of patient participation, however, the project was cancelled.

Rather than give up entirely, however, I decided that I could work to reduce anxiety levels directly through my research by creating patient education sheets for distribution at Memorial Sloan Kettering on topics such as the BRCA gene, the mutation of which leads to an increased risk for developing breast cancer, among others.



Since then, I have continued my work on patient education at the hospital's Integrative Medicine center under the mentorship of Dr. Ting Bao, MD, for patients involved in clinical trials studying the efficacy of acupuncture in treating chronic CIPN (chemotherapy-induced peripheral neuropathy). This is a condition in which the peripheral nerves in the hands and feet are damaged as a result of chemotherapy. Recent studies have indicated dietary supplements may be effective in reducing the symptoms of CIPN, and I work to bring such information to patients while also assisting with data analysis and writing a literature review of my own on CIPN.

Despite the lack of success with my first research project, I feel fortunate to have had the opportunity to work with over a dozen doctors and researchers committed to helping patients through minimizing anxiety and good primary care. An understanding of how to best care for patients is imperative for all future doctors.

CLASS OF 2018 ANTE SOKOSA

I am working under the mentorship of Eric Raguzin at Brookhaven National Laboratory on Instrumentation Engineering and Physics in project nEXO. The experiment was designed to determine whether a neutrino is its own antiparticle, and if so, what its mass is. My mentor and I are currently working on the sensors that will measure the emitted electrons, which will aid us in determining whether the neutrinos will annihilate each other, thus proving it is its own antiparticle. Results for the neutrino being its own antiparticle, and its mass would violate the standard model and allow for advancements in rocket boosters.





CLASS OF 2018 JOSEPH WIRTA

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In September 2015, The American College of Surgeons released a compendium filled data, research and testimony on strategies to improve survival in active shooter / intentional mass causality incidents. This year my research focuses on the "Hemorrhage Control Aspect of the Compendium". Under the guidance of my mentor, I have examined the anatomy and physiology of hemorrhage, the efficacy of tourniquets and other hemorrhage control techniques, as well as the implications of hemorrhage control in everyday occurrences and mass causality incidents.

Circulation & Hemorrhage Control



"Note: Do not apply pressure to both sides of the neck at the same time. This would cut off the blood supply to the brain.

CLASS OF 2018 NICHOLAS ZECCA

For my project, I will be continuing my research on ovarian cancer with my mentor, Dr. Paul Sabbatini. study that pertained We worked on a to immunotherapy. We used numerous patient medical records, approximately 100 patients, for our study. We determined numerous biomarkers for what could be a potential cause of progression of their ovarian cancer. We then pulled this information from the medical records that we gained access to, and put them into a table. Once we did this, we compared the biomarkers and the information we found for each marker. After this was done, we submitted the work to the American Society of Clinical Oncology's annual meeting in 2017. This year we continued to add biomarkers for the project and further research possible points and causes of progression of disease with treatment of immunotherapy.





CLASS OF 2018 EDGARDO ZELAYA



Under the guidance of my mentor, Dr. Michael Elice, I am currently studying "The Effects of Medical Marijuana on Patients with Autism Spectrum Disorder" (ASD). Together we have also been researching how to regulate mast cells. Our goal is to improve living standards for those who suffer from ASD and to raise awareness for the options afforded to families that will enable them to accommodate those with this disorder. ASD is a serious developmental disorder that impairs the ability to communicate and interact while impacting the nervous system.



CLASS OF 2019 ANTHONY EVANGELOU

Under the mentorship of Dr. Anne Pirro-Radeos at New York Presbyterian, I work in the Oncology Department with the clinical trials. One of the trials I am focusing on is whether Atezolizumab or Placebo is a more efficient treatment for cancer when paired with other drugs. We are currently screening and starting the trials on patients. This trial will determine a better and more successful option in treating cancer. The more effective drug will improve quality of life, increase life expectancy and effectively deteriorate the tumor. By participating in these trials I learn with hands on experience of the effect that these treatment plans have on patients; an experience which is truly a privilege and that wouldn't be able to be replicated anywhere else.



CLASS OF 2019 ALEXANDER LOUKOPOULOS



Under the mentorship of Jessy James and Dennis J. Stanford, P.E., ENV SP at the DEP, I have researched the theoretical application of superconductors in transporting energy from renewable sources around New York State here to New York City. The state's most significant renewable energy sources are located upstate, so the process of moving that energy to New York City can be costly, as the current system is susceptible to energy loss over such large distances.

Superconductors are unique materials that lose no energy when cooled below a certain temperature, and if the material could be used to transport this energy, then the amount of energy lost can be greatly reduced.

My research will review the transportation of renewable energy, including how much it costs to transport, and the pros and cons of both the current system and a possible system where superconductors are implemented.

CLASS OF 2019 JOSEPH MONIZ



I am working with Dr. Todd Disotell at New York University researching the "Evolutionary Genetics and Phylogenetic Relationships of Tarsiers". Tarsiers are haplohine primates. The project involves the genomes of the tarsiers. For the first time in mammals, scientists have identified a complete mitochondrial genome insertion within the nuclear genome. Therefore, it is unclear whether certain parts of the nuclear genome are in fact the actual nuclear genes or parts of the mitochondrial genome. Our project aims to sequence the tarsier nuclear genome along with the mitochondrial genomes of several tarsier species in order to distinguish the nuclear genetic material from the mitochondrial genetic material. The results of this project may change the phylogenetic understanding of tarsiers.



CLASS OF 2020 SEBASTIAN LIBUDA



My research topic focuses on "Sepsis". Sepsis occurs when bacteria invades the bloodstream and can be life threatening. Through the reading of many journal articles, I discovered how many hospitals treat sepsis, how sepsis develops and the idea of SOFA. SOFA is a grading system that hospitals use to diagnose the patient when they come in with sepsis. SOFA stands for Sequential Organ Failure Assessment. SOFA uses a numerical scale. The higher the number on the scale indicates the severity of the infection.

I plan on continuing my research project at Hoboken University Medical Center-Department of Emergency Medicine. I will be working with my mentor and medical students. We will be conducting experiments that hopefully will lead to the prevention of sepsis in patients.

CLASS OF 2020 JAHIR MORRIS



Major Impacts of Climate Change on Deep Sea Benthic Ecosystems

The deep sea encompasses the largest ecosystems on Earth. Although poorly known, deep seafloor ecosystems provide services that are vitally important to the entire ocean and biosphere. Rising atmospheric greenhouse gases are bringing about significant changes in the environmental properties of the ocean realm in terms of water column oxygenation, temperature, pH and food supply, with concomitant impacts on deep-sea ecosystems. Projections suggest that abyssal (3000-6000 m) ocean temperatures could increase by 1°C over the next 84 years, while abyssal seafloor habitats under areas of deep-water formation may experience reductions in water column oxygen concentrations by as much as 0.03 mL L-1 by 2100. Bathyal depths (200–3000 m) worldwide will undergo the most significant reductions in pH in all oceans by the year 2100 (0.29 to 0.37 pH units). O₂ concentrations will also decline in the bathyal NE Pacific and Southern Oceans, with losses up to 3.7% or more, especially at intermediate depths. Another important environmental parameter, the flux of particulate organic matter to the seafloor, is likely to decline significantly in most oceans, most notably in the abyssal and bathyal Indian Ocean where it is predicted to decrease by 40-55% by the end of the century. Unfortunately, how these major changes will affect deep-seafloor ecosystems is, in some cases, very poorly understood. In this presentation, the author provides a detailed overview of the impacts of these changing environmental parameters on deep-seafloor ecosystems that will most likely be seen by 2100 in continental margin, abyssal and polar settings. We also consider how these changes may combine with other anthropogenic stressors (e.g., fishing, mineral mining, oil and gas extraction) to further impact deepseafloor ecosystems and discuss the possible societal implications.

Holy Cross High School

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The Science Research Program, taken in addition to another scheduled science course, is a threeyear program designed to present to qualified students the opportunity to perform independent scientific research under the direct supervision of a mentor from a university or hospital. Students in this program may pursue college credit from the SUNY system through the University at Albany.



