

**BROTHER AUBERT HARRIGAN C.S.C.**

**Science Research Program**

**2017**



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

“THE MORE I STUDY  
SCIENCE, THE MORE  
I BELIEVE IN GOD.”

*Albert Einstein*

# 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, he will be researching a topic of his 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 his mentor, designs a science research project that he 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 young men 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

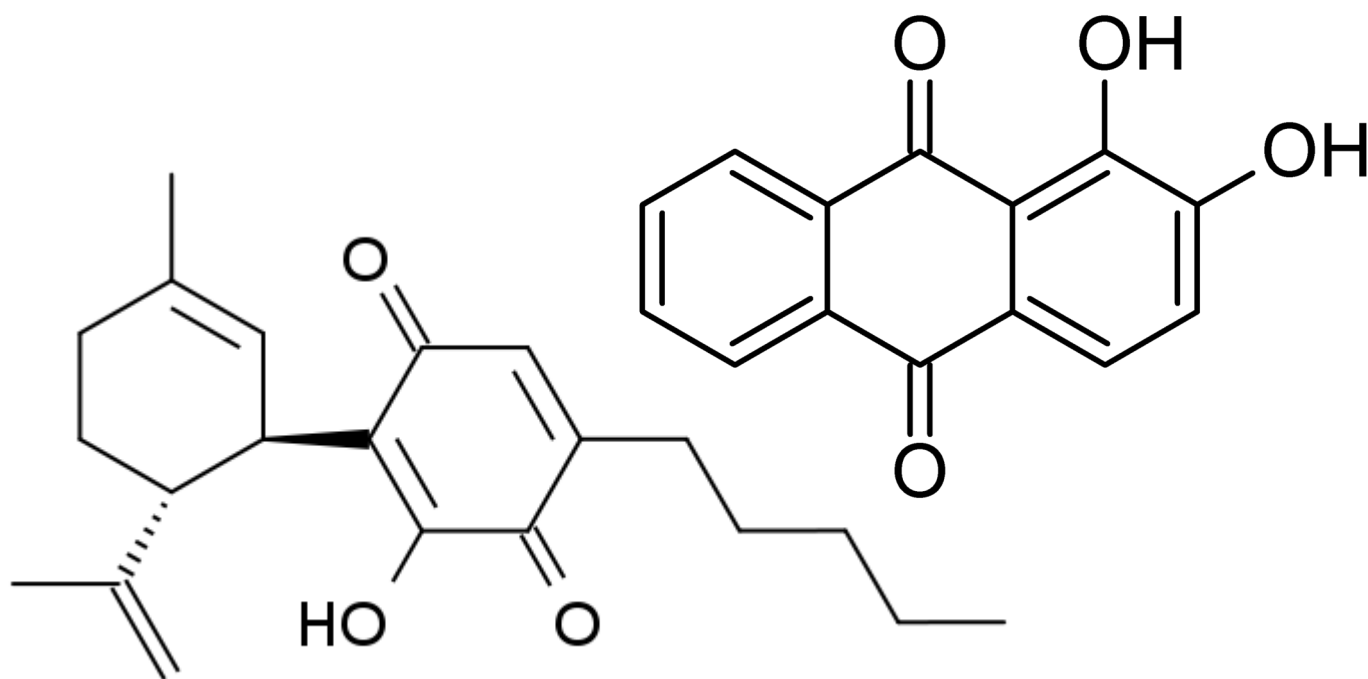


**Dr. Anthony Paratore**  
*Program Advisor*

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 St. 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, Adriana.



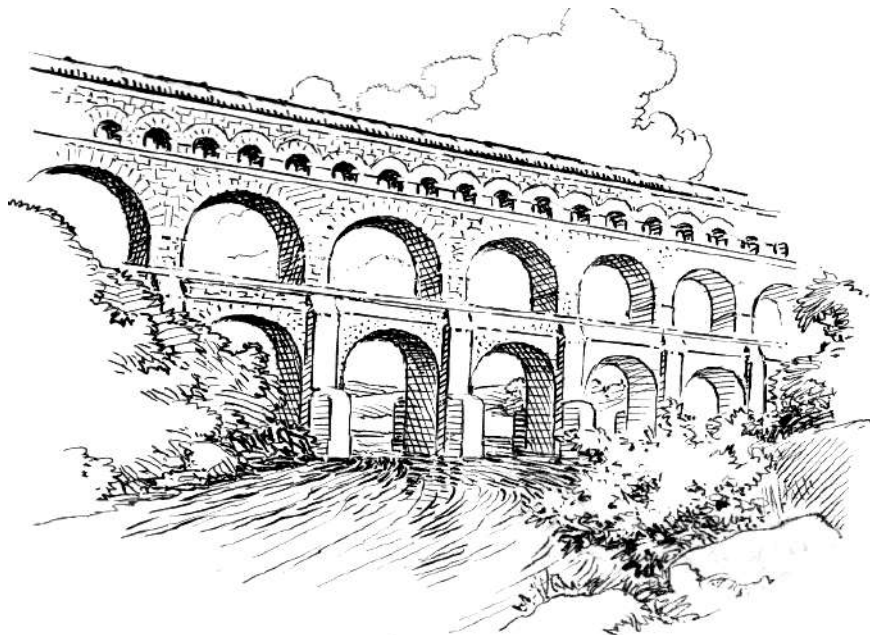
# CLASS OF 2017

## CHRIS KOILPARAMPIL



For the last two years, I have been researching the topic of Hydraulics under the guidance of Mr. James Canale at the Department of Environmental Protection. Under Mr. Canale's mentorship, I have been analyzing and theorizing possible improvements to the New York City Aqueduct System.

During my Junior Year, I studied the growth of biofilm in the aqueducts, and its detriment to the efficacy of the aqueducts. This research led me to the discovery that there was a large amount of energy being wasted in the aqueduct system. This energy came from the fact that the aqueduct was using structures that took the pressure of the water and converted it into sound and heat. That was the starting point of my research for Senior Year. My essential goal was to find a way to harvest the lost energy. The most efficient and practical method was by using a system of generators. Basic calculations indicated that the addition of the generators would provide a significant amount of energy for New York City to use at the same time as conserving the energy that otherwise would be wasted.



# CLASS OF 2017

## PATRICK MULLER



In the past year, I have continued my research on a pilot study under the mentorship of Dr. Bryan Muller. This pilot study is focused on the average listener's experience of analog and digital recordings of the same piece of music. Qualitative methods informed by the music psychotherapy method, Guided Imagery and Music (GIM), were used to gather data.

Our preliminary findings over the first year of study indicated compelling differences in physical, emotional, and psychological aspects of the listener's experiences. Succeeding our initial findings, we gathered information into a research paper, which we are currently enhancing with additional data.

Through careful analysis of our preliminary findings, we have been able to re-design the study by asking different questions allowing us to fully understand each listener's experience and any differences between analog and digital experiences. We intend to reach a total of 15 test subjects for our pilot study and to publish our findings.



# CLASS OF 2017

## JULIUS ROMERO



After completing our previous study my mentor, Dr. Niket Sonpal, and I worked together with his research team to conduct a study on the accuracy of healthcare information presented in YouTube videos. Because a large number of patients (40%) trust medical information found via social media, we wanted to see just how reliable this information was. Furthermore, we wanted to help better prepare clinicians to answer questions their patients may have, and help them educate their patients.

To do this, we analyzed a number of YouTube videos under a keyword, such as IBD, and evaluated these videos based on certain criteria. We then graded them on a scale of 1-5 based on quality. One being inaccurate and unimportant information, and five being of excellent overall quality. We were able to come to a firm conclusion about the accuracy and quality of the health care information found on YouTube.

In the fall of 2016, our study was published by the American Medical Association and presented at their conference held in Orlando, Florida.

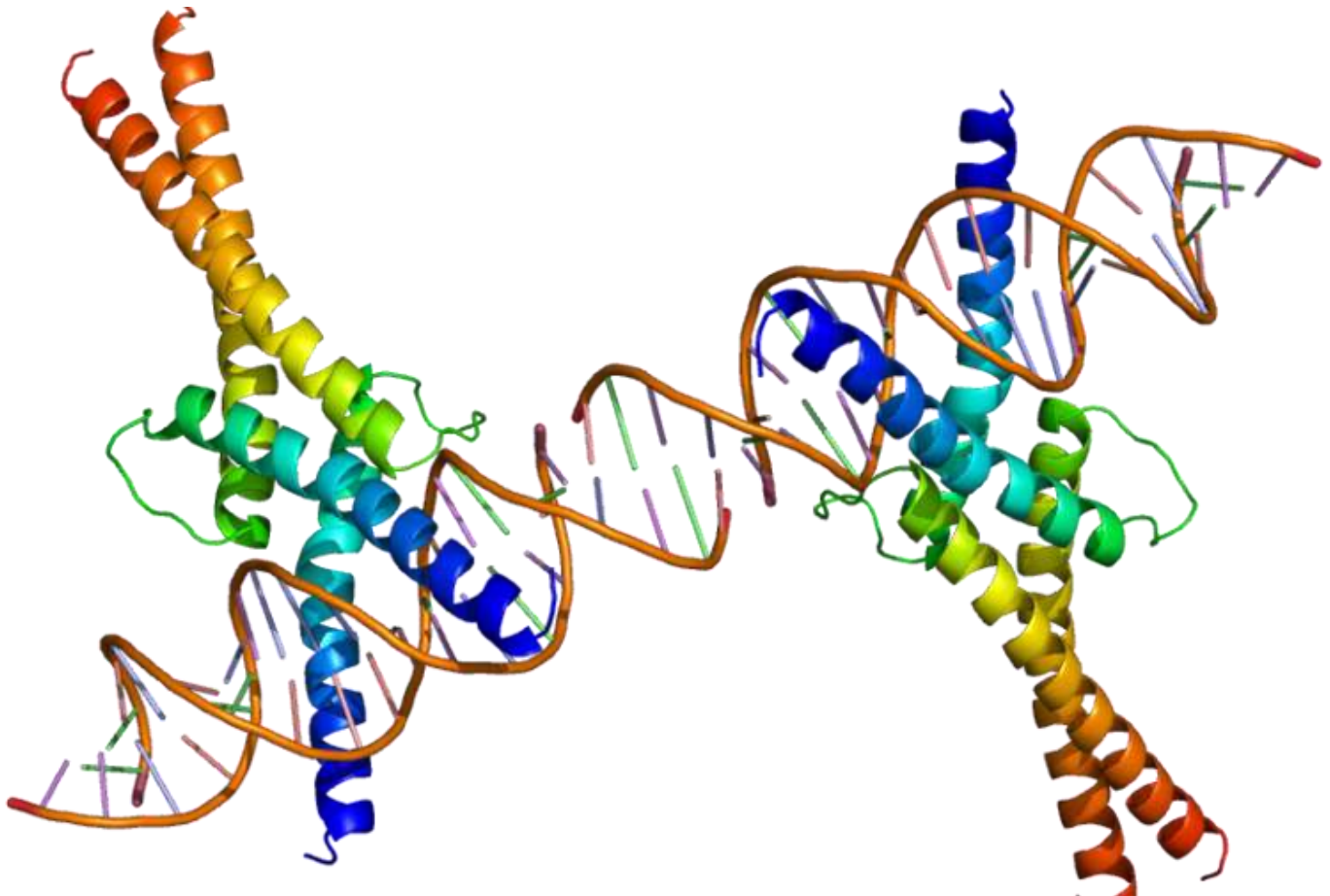


# CLASS OF 2017

## NICHOLAS SIMONE



Over the summer, Dr. Demi Cheng, from John Jay College, and I worked on uncovering the p21 signaling mechanism in response to exposing PC12 cells to two fungicides, Maneb and Mancozeb. The p21 pathway has a major role in regulating the cell cycle. We discovered that the phosphorylation of p21 via P13/Akt is what deactivates the protein. The activation of p21 by dephosphorylating it is a stress response that triggers cell cycle arrest. P13/Akt is a protein kinase that acts as a regulator of p21 activity. It is shown to play a huge role in the cellular stress response.





# CLASS OF 2018

## ANTONIO ARGUDO



Designing computer hardware is an imposing task for anyone. First you have to learn the various hardware languages necessary for designing the hardware. Then you have to learn to use the various tools necessary for designing and testing the hardware you are intending to create. Once you design the hardware you must compile the language written down to root out any language mistakes, then you must use a test-bench to make sure it works. This is the standard procedure for creating hardware and will be explained and demonstrated throughout my research.

## DANIEL ANDRADE



The aim of cancer immunotherapy is to harness, strengthen and sustain the power of the immune system to fight cancer. Though not as well-known as chemotherapy and radiation, immunotherapy actually predates both of these cancer treatments. Under the guidance of my mentor, Senior Oncology Physician Associate, Ann Pirro-Radeos PA-C, MS, MPH, MSPS at New York Presbyterian, we will conduct various experiments, and based on our results we will prove that combining immunotherapy with chemotherapies, or immunotherapy with radiation, will have better outcomes treating patients with cancer than chemotherapy or radiation by itself.

# CLASS OF 2018

## JOSEPH WIRTA



Traumatic Brain Injuries are a leading cause of death in the United States of America and worldwide. Helping to define, redevelop, and implement protocols, policies, and procedures is essential in the care and treatment of such brain injuries. The research I have done throughout the past year has allowed me to better understand the concepts of treating Traumatic Brain Injuries in the prehospital spectrum, the controversial concepts, and what is trying to be done to help improve the efficiency and care of these injuries.

## NICHOLAS ZECCA



I will be continuing my research under the mentorship of Dr. Paul Sabbatini at Memorial Sloan-Kettering Cancer Center (MSKCC). We have been investigating a research study that pertains to specific biomarkers that can be observed during immunotherapy treatment of ovarian cancer. In addition to this research, we will also be conducting other studies and experiments focused in the area of immunotherapy.

# CLASS OF 2018

## EDGARDO ZELAYA



Under the guidance of my mentor, Dr. Michael Elice, I am currently researching how medical marijuana affects patients with Autism Spectrum Disorder (ASD). ASD is a serious developmental disorder that impairs the ability to communicate and interact as well as impacting the nervous system. I am also researching the topic of mast cells and how to regulate them. 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.

## MARCO GHIOZZI



The main topic of my research is DNA targeting and cutting. The research is to find three different systems that accomplish this DNA targeting. The first type, Type I Systems, uses 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 use complexes for DNA/RNA targeting, but they are different from Cascade. There has been evidence of RNA cutting from the Type III System, and there has been other evidence found by numerous labs with similar information. It is not fully understood what happens to the DNA inside the cells during the Type III System.

# CLASS OF 2018

## ANTE SOKOSA



My research focuses on Systems Engineering. I work with my mentor at Siemens Inc., which is located in Westchester, New York. Systems Engineering is an approach to complete a task by building a system, which, in definition, is a set of interrelated components working together as an integrated whole to achieve some common objective. This accomplishment would only be possible through system engineering. An example of a simple system would be a washing machine. It consists of many parts: an electric motor, pump, timer, several valves, and sensors. This cannot all be done by the work of just one type of engineer. Several types are needed, from electrical to mechanical, software, chemical, etc.

## JOSEPH ROMERO



Under the guidance of my mentor, Dr. Ron Feinstein, I am researching obesity in the United States. Together, we are looking into the causes of obesity and its effects on people of all ages. We are studying various groups of people focusing on their dietary habits. Once all data has been collected, we will begin to discover the causes of obesity and the problems associated with being overweight in various groups of people. We plan to continue researching ways to work on a positive, healthy alternative lifestyle for groups we work with.

# CLASS OF 2018

## THEO KARANIKOLAS



Working with Dr. Richard Barrakat and Dr. Debra Mangino at Memorial Sloan Kettering Cancer (MSKCC), my study focuses on the level of anxiety in women at high risk for breast cancer. Such patients are considered to be at ‘high risk’ due to personal family history of breast cancer or a related condition, such as LCIS, that can lead to the development of breast cancer in the future. These women are also likely to have higher levels of anxiety surrounding breast cancer than women who do not have any of these factors because there is a more frequent screening and prevention process for these patients. Social support, e.g. seeing a therapist, has been known to reduce the level of anxiety. Its effect on the level of anxiety surrounding breast cancer will be compared to the effect of chemoprevention, or certain medications that reduce the risk of developing breast cancer. Two questionnaires will be distributed over the course of six months to approximately 100 patients at MSKCC.

# CLASS OF 2019

## ANTHONY EVANGELOU



My science research topic will focus on oncolytic viruses. These viruses are used to help deteriorate and destroy tumors. My mentor and I will be working to see how oncolytic viruses can be perfected in the fight against cancer.

## ALEXANDER LOUKOPOULOS



I am currently researching with my mentor, Mr. Jessy James, an electrical engineer who works for the Department of Environmental Protection. Currently, Mr. James is teaching me the basics of electrical wiring, and the structure of every day and industrial wiring. With this information, we will eventually build up to the topic of superconducting wires, which is a complex idea that implies a wire with no electrical resistance whatsoever, meaning it can carry one charge an incredibly long distance without any dispersion.

# CLASS OF 2019

## JOSEPH MONIZ



I will be working with Dr. Todd Disotell at New York University in researching the evolutionary genetics of anthropoid primates. The goal of the research is to understand how the anthropoid genome has evolved over the past 40 million years. Modern methods of DNA analysis will be used to assemble a dataset of anthropoid primate genomes. This dataset will be used to infer a phylogeny of the anthropoid primates, and to identify regions of the genome that potentially have a functional significance. With this, we will be able to identify lineage-specific functional genetic variations, as well as identify signatures of positive selection in protein-coding genes.

