

**2022 Class of 1971 SUMMER SCIENCE fellowship Recipients**



September 6, 2022

Branford College

**BRANFORD COLLEGE RECIPIENT**

**STUDENT** **CLASS YR**

Ann-Marie Abunyewa……………….…………………………………………………………………………………… 24’

Zeren Toksoy……………….……………………………………………………………………………………………….…24’

Ann-Marie Abunyewa

Amount: 2,500

**Bio:**

Ann-Marie is a junior in Branford double majoring in Classical Civilization and Molecular Biophysics & Biochemistry. Outside of research, she works at the Yale University Art Gallery as a part of the Gallery Guides program, where she provides tours to the public about select objects within the Art Gallery’s collections. She also works within the Rights and Reproductions department at the Art Gallery, where she connects with curators, archivists, and museum workers across the world about reproducing images of the works housed in the Art Gallery. Ann-Marie volunteers at HAVEN Free Clinic within the Education department, helping patients improve and maintain healthy lifestyles through diet and exercise. She is also an active member of Danceworks and manages and edits production and design for several publications on campus. After Yale, Ann-Marie hopes to attend medical school.

**Summary:**

This past summer, Ann-Marie conducted research under the mentorship of Dr. Andrew Miranker, Monica Grasty, and Dr. Kate Schilling, working on extracting DNA from objects of cultural heritage, with a particular focus on aged, rootless hairs. The value of the nature of this work is that biochemists, in collaboration with curators, archivists, conservators, and museum directors, would be able to produce new information, through genomic and biochemical analyses, that enhance the stories of objects held in art and historical collections. The main challenge of extracting from objects of cultural heritage is generating enough data useful for computational genomic analysis, as DNA from these objects are frequently fragmented and damaged. To overcome this challenge, Ann-Marie has successfully tested and is currently refining two novel protocols, which involve magnetic bead extraction, multiplex PCR, single-stranded adapter ligation, qPCR, agarose and polyacrylamide gel electrophoresis, in-lab DNA sequencing, and bioinformatic pipelines specialized for highly fragmented DNA. She has also worked on strategies to target and analyze specific sequences in the human genome that are highly polymorphic — *i.e.*, genetic sequences that are almost completely unique to each individual. By targeting and analyzing these sequences, many questions about cultural heritage objects can be answered: who the object might have belonged to, how many people interacted with the object and the nature of their interaction with the object, the composition of an individual’s microbiome, and more. Ann-Marie plans to continue this research during her remaining time at Yale.

Zeren Toksoy

Amount: 2,500

**Bio:**

Zeren Toksoy is a Molecular Biophysics and Biochemistry Major on the pre-med track in the class of 2024. He has a deep love for both Physics and Biology and is very interested in studying the intersection of these disciplines in the form of biophysics. His research is in this field and he is interested in finding its medical relevance. Outside of research, Zeren is involved in several clubs and organizations around campus. Having grown up in Connecticut and attended high school nearby, Zeren strives to give back to the New Haven community. As part of the Yale Hunger and Homelessness Action Project (YHHAP), Zeren is the Recruitment and Communications Director for Kitchen to Kitchen (K2K) which seeks to deliver leftover food from dining halls to the Downtown Evening Soup Kitchen (DESK). In his leadership role, Zeren is involved in the recruitment of new volunteers and in ensuring the organization of food deliveries each day. He is also the Co-founder and Co-head of another project of YHHAP, the Community Health Care Van. This project assists people impacted by HIV/AIDS, illicit drug use, homelessness, and mental illness, and overcomes the traditional medical care barriers by bridging the gap to link patients to medical and social services. Additionally, Zeren is involved in several projects at the HAVEN Free Clinic, a student-run clinic that provides free healthcare to the uninsured population of New Haven. He was a part of the Clinical Outcomes Project and is the head of the Patient Satisfaction and Volunteer Satisfaction projects. He organized numerous town halls, collected, and analyzed data to provide clinic recommendations and interventions, and implemented a system to improve workflow for the new Care Coordination Department. In these opportunities, he has been able to give back to the New Haven community in a valuable way.

**Summary:**

With The Class of 1971 Summer Science Fellowship funding, Zeren performed summer research in the Howard lab studying microtubule severing enzymes and their relevance in the neurological disorder, hereditary spastic paraplegia (HSP). HSP is a group of heritable disorders causing weakness and stiffness in individuals’ legs and is associated with degeneration of motor axons in the spinal cord. HSP is known to be associated with mutations in the genes encoding the enzyme spastin, an AAA+-ATPase protein responsible for severing microtubules and regulating microtubules dynamics. There are two main isoforms of spastin: the more abundant, soluble M87 and the insoluble membrane bound M1. M87 spastin has been shown to assemble into a hexamer and uses ATP hydrolysis to remove tubulin and sever microtubules. Membrane bound M1 has been shown to increase in concentration over an individual’s lifetime and its mutants appear to have greater toxicity. While this suggests a crucial role of M1 in HSP, the function and interactions of M1 are not well characterized. Zeren investigated the mechanism by which spastin, specifically the M1 isoform, acts to sever microtubules. He found the severing activity of spastin is activated by M1 recruiting microtubules to the membrane and forming an active hetero oligomer with M87. By elucidating the role of M1 and the exact mechanism of microtubule severing, Zeren hopes to greatly contribute to the understanding of mutations in spastin in individuals with HSP.

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