Ted Mullin Fund Scholars Summer 2015

Sam Kim, Illinois Wesleyan University '17

This summer I had the wonderful opportunity to work at the Pediatric Hematology Oncology department at the University of Chicago thanks to the generous program fund from the Mullin Family. The Ted Mullin Program allowed me to peer into the field of medicine both in the clinic and in the laboratory. The program answered any questions I had about medicine, and it ultimately helped me solidify my decision to pursue a future career path in medicine. Along with the valuable insight, I gained equally valuable experience from the program. Even though this program lasted a short 10 weeks, I learned an incredible amount within this short span of time. This summer I worked with CRISPR/Cas9 complexes to make a CG2 Casper fish in order to assist Dr. de Jong to study the mechanism of leukemia development. Although I would not be able to fully see the end results of my work, I honed and sharpened my laboratory skills. In all, I greatly benefitted from the Ted Mullin Fund Scholars Program in every way possible.

Milee Nelson, Vassar College '16

Let's imagine that you are an undergraduate and interested in medicine and/or science. What do you do? The obvious choice would be take a multitude of science courses, work in your college's labs, shadow physicians, etc. Thousands of students have come before you—but this path often lacks something special. At least it did for me—and that was action with a greater purpose.

This past summer, I had the privilege of working in the Susan Cohn lab at the University of Chicago on Neuroblastoma—a solid tumor prevalent in pediatric oncology. Under the guidance of Mark Applebaum and Sue Cohn, I investigated the phenotypic effects of hypoxia on various Neuroblastoma cell lines—specifically the effects of hypoxia on apoptosis and proliferation. I concurrently began similar work with Neuroblastoma cell lines transfected with siRNA—a continuation of genomic analysis work done by Dr.

Applebaum prior to my arrival. Beyond basic tissue culture skills, I became proficient in a variety of lab techniques including flow cytometry for cell cycle and side population analysis, MTT and Caspase assay analysis, RNA and cDNA purification, TUNEL staining, transductions and plasmid preps, etc. It was however the overall experience itself that held greater value. I worked alongside a group of doctors and scientists in developing my skills and fostering my practical knowledge of the intricacies involved in medical science. I spent the majority of my days asking more questions than getting answers and becoming comfortable with the unknown (a world scientists and doctors are all too familiar with). I cannot express how incredible this summer has been for me and I am beyond excited to rejoin this world upon my graduation in May.

Zihan Su, Williams College '17

Participating in the Ted Mullin Fund Scholars Program this past summer was an invaluable experience to me. I worked in Dr. Beyer's lab and studied gap junctions and the role they play in arrhythmias induced by sleep apnea in a model where mice were subjected to intermittent hypoxia. This experience greatly enhanced my skills in lab, and the experience also allowed me to develop critical organizational and planning skills important when designing and carrying out an experiment. Aside from lab work, I was able to observe the first-hand intellect and passion everyone (from physician-scientists, researchers, medical students, and undergraduates) in the lab had for their jobs. They were not only amazing teachers but also wonderful people to work with. This experience definitely re-affirmed my interest in the field of medicine and research, and I cannot say enough about the wonderful relationships I've made.

Amanda Wu, MIT '18

The Ted Mullin Fund Scholarship gave me the opportunity to learn valuable lab skills and introduced me to the complex world of cancer research. I especially enjoyed shadowing my PI, Dr. Kenan Onel, during in-patient rounds and getting to learn the ins-and-outs of the hospital. Shadowing made me feel even more passionate about cancer research and has inspired me to continue it at MIT. The environment of a university hospital provided a great setting to see how learning, research, and treatment all work together at the

forefront of medicine.

Ted Mullin Fund Scholars Summer 2014

Katie Bennett, Williams College ‘16

The value of a summer spent in the Beyer lab at University of Chicago is difficult to explain. To my college friends, I was "working in a lab." To my family, various non-science-speaking friends, and little teammates demanding to know where I would be all season, it was "professional nerd." The content is fairly straighforward, as science goes: I worked with Joanna Gemel to stain sections of human heart tissue and quantify expression of connexins, a family of gap junction proteins that are important for intercellular communication, as well as developing a protocol for quantification of qualitative data (more simply, how to get numbers from pictures). These were the finishing touches for a paper she will be publishing soon. I also kicked off a new project delving into the ways connexins go wrong. I replicated mutant sequences and gave them homes in two plasmid vectors, then used these to tranfect human cells, which I stained to look at localization of the misbehaving connexins. Beyond the bench skills of tissue culture, Western blotting, immunofluorescence, and bacterial tranformation, I learned about the culture of a lab. The people with whom I spent my summer in the KCBD were doctors, physician-scientists, researchers, medical students, and regular undergraduates like myself. The remarkable passion and intelligence they used to attack the problems posed and questions asked was something I was more used to seeing from competitors in the pool. Thanks to the Ted Mullin Fund, I have seen that a future in science is more nuanced, and more exciting, than a stereotypical pre-med track or eternity in graduate school. There are a million ways for a scientific mind to find its niche, and I have confidence that I will find the one that best suits me.

Update 2015: *My work as a Ted Mullin Fund Scholar was published in the Journal of Molecular and Cellular Cardiology in November 2014, and I was listed as an author. This definitely helped me obtain my position this summer as an NIH Summer Intern in the Cardiac Physiology section, and*

my skills from last summer have been an a significant asset. I will soon return to Williamstown to start my honors thesis in Biology, which is focused on statistical analysis and interpretation of ecological data.

Joyce Kim, Carleton College '17

Participation in the Ted Mullin Fund Scholars Program gave me a great opportunity to spend a valuable and meaningful summer. During this 10 week program, I had the privilege to work in Dr. Susan Cohn's lab with great mentors and wonderful people. I worked on a project of my own on Neuroblastoma and also had the chance to shadow doctors. The lab experience I had developed my practical skills on bench work and encouraged me to grow as an independent researcher. It also gave me insights on the recent progress of cancer research, to which I hope to contribute in the future. The clinical side of observing the doctors' perspectives of giving the utmost care to patients shaped what kind of a doctor I wanted to become. It allowed me to explore different forms of care that can be given to patients. These great experiences and relationships I was able to develop throughout this program affirmed my aspiration to become a pediatric oncologist and reinforced my confidence to pursue my dream.

Update 2015: *The experience I had last summer as a Ted Mullin Fund Scholar opened a new summer research opportunity to work as a summer intern at the Harvard Stem Cell Institute. I am currently working on rhabdomyosarcoma, looking at the disease from the perspectives of epigenetic and gene expression level. Being a Ted Mullin Fund Scholar helped me to gain strong research experience and set the foundation for my future research on pediatric cancer.*

Rachael Loek, Case Western Reserve University '16

During my first two years at Case Western Reserve University, I wanted to get into research, but I never was able to find something that didn't require prior experience. The Ted Mullin Scholarship helped me to gain the experience that is so vital for the rest of my years in college. I learned valuable concepts in the lab, while also learning skills with zebrafish in the fish room. During my ten weeks, I did countless experiments that contributed to the overall project that the lab was working on, like running

PCR's, gels, tail clipping fish, and transcribing DNA into RNA. Along with all the success I have had in the lab, there have also been plenty of failures. Trouble shooting and working through my challenges showed me how to really think about the problem and is the most valuable thing I learned over the summer. I cannot express how important this scholarship has already been for my education and I'm excited for what the next few years bring me.

Update 2015: *After the 2014 summer of my Ted Mullin Fund scholarship, I was able to join a lab at my school, Case Western Reserve University, because of all the experience I gained during my time at the University of Chicago research lab. I will work in this new lab using zebrafish to examine and understand the genes of the ear for a total of 2 school years, my junior year and upcoming senior year. I would not have been able to get this research position without my previous experience in the lab I through the Ted Mullin Fund scholarship.*

Edan Zitelny, Brandeis University '17

When I heard the news that I was selected as a Ted Mullin Scholar, I was excited, eager and humbled. I was thrilled to take part in an on-going pursuit to make a difference in the lives of pediatric cancer patients. This program provided me with the opportunity to work in a world-class lab environment, engaging in a medical research. Under the guidance of Dr. Ken Onel and his team, I was assigned to research cancer evolution and the progression of Acute Myeloid Leukemia (AML) and Extramedullary AML. I was inspired by the dedication of the staff I worked with and their advanced medical knowledge. Being exposed to the research process and medical excellence cemented the idea that research and medicine are concurrent and dependable upon each other. This program motivated me to remain determined through tough failures and continue to strive for success. I gained a new appreciation for medical research and a newfound interest in a potential MD/PhD program. I would like to personally thank the Mullin family for giving me the opportunity to explore and engage in this research program and I look forward to putting the skills I have learned in the past ten weeks into practice.

Update 2015: *This summer, I have the incredible opportunity to work in a microbiology lab at Brandeis University. The lab investigates cell stress and its subsequent effects on transcription and translation. Being*

selected for and excelling in this position would not be possible without the knowledge and experiences gained through the Ted Mullin Scholars Program.

Ted Mullin Fund Scholars Summer 2013

Maryellen Campbell, Georgetown University '16

I applied to the Ted Mullin Fund Scholars program at the University of Chicago to gain experience working in a medical research lab. Through the course of the summer I was exposed to a variety of methods used in oncological research, and participated in important projects for Dr. Susan Cohn's lab, which investigates Neuroblastoma. The most profound and enjoyable aspect of the summer for me was coming to understand the relationship between scientific research and clinical treatment. By interacting with physicians, Ph.Ds, graduate students, and lab technicians I learned about pediatric oncology treatment from every angle. I now have a deeper appreciation for the teamwork and cooperation involved in medicine and science. This opportunity has affirmed my desire to become a physician, and I encourage anyone interested in science or medicine to apply.

Update 2014: *The effects of my summer as a Ted Mullin Fund Intern continue to impact my life. Most notably, my lab skills have improved in my science classes. I continue to participate in the Hour of Power each year with the Georgetown swim team, and we hope to expand participation to other varsity athletic teams this year.*

Update 2015: *I am a rising senior studying Economics while completing the pre-med courses at Georgetown University. During the past year, I participated in a program with the NASA District of Columbia Space Grant Consortium where I helped design an experiment that was launched to the International Space Station in January 2015. The experiment tested the ability of chrysanthemum morfolium seeds to germinate in a microgravity environment. These plants are effective at removing toxins from air in enclosed spaces. I took the MCAT in June and plan to attend medical school after graduating.*

Lauren Kasoff, Washington and Lee University '14

Working at the University of Chicago lab was a valuable opportunity and experience for me both inside and outside of the lab. This experience has had an important effect on my understanding of the relationship between basic research and the clinical setting. It also revealed to me that I enjoy engaging in programmatic research. I feel certain now that I will attend either medical school or graduate school in neuroscience. Prior to participating in the Ted Mullin Fund Scholar Program, my career outlook was very approximate. Even though I remain uncertain about which path I will follow, I can now say that I have a better handle on what I would like my work to involve. I know that I could now thoroughly enjoy working in a lab. On the other hand, I also learned that I enjoy working with patients. Although I may not have figured out if I want to be at the bench, the bedside, or both, I do know that I want to have an impact. This internship confirmed the aspirations that I have for myself and bolstered my confidence that I can achieve them. Most importantly, the Ted Mullin Fund Scholar Program allowed me to make a difference in the lives of others.

Update 2014: *Since completing my summer as a Ted Mullin Fund Scholar at the University of Chicago, I graduated Magna Cum Laude from Washington and Lee University with a B.S. in Neuroscience as well as a B.A. in Psychology. My time as a TMF Scholar afforded me the opportunity to currently partake in the National Institutes of Health's (NIH) Postbaccalaureate Intramural Research Training Award (IRTA) program. At the NIH, in the Child Psychiatry Branch, I continue to work with an extraordinarily rare illness—Childhood Onset Schizophrenia (which has an incidence of less than 0.04%) —within in a pediatric population. During my time at the U of C, I discovered that I enjoy the bench side as much as I enjoy the bedside. As a member of Dr. Judy Rapoport's laboratory, I am afforded the opportunity to continue this balance. In particular, as a genetics IRTA, I isolate plasma from whole blood, purify DNA from whole blood, culture fibroblasts, and assist with skin biopsies. There are also opportunities to conduct social/emotional testing, neurocognitive testing, and MEG scans with patients, their siblings, and normal volunteers. In the future, I plan to attend either graduate or medical school.*

Update 2015: *Recently, I moved to Rhode Island to begin working for the Pediatric Mood, Imaging, and NeuroDevelopment Research*

Program at Bradley Hospital, which is associated with Brown University's Warren Alpert Medical School. The PediMIND program is dedicated to identifying biological and behavioral markers for psychiatric illnesses in children and adolescents in order to help improve the diagnosis, treatment, and prevention of these conditions.

Connor Sholtis, Amherst College '15

Working in the labs at the University of Chicago was an amazing experience. In my ten weeks at the University, I learned how to maintain cell cultures, run western blots, do PCR, and transfect cells, among many other things. I experienced success and, more often than I would've liked, I experienced failure. However, with each failure I learned from my mistakes and became more and more proficient. Aside from teaching me the basics of protocol and etiquette, working in the lab exposed me to the many brilliant minds involved in medicine and research. I was given the opportunity to shadow several professionals in the field, ranging from residents to veteran physicians. Each of them provided insight on the field of medicine, shared their experiences from the past, and offered their assistance if I ever needed help in the future. Though I was initially intimidated by them, I learned to relax a little bit, and ended up making great connections with those around me. Though I added many lab protocols to my arsenal, the most important things I took from my time in Chicago were the relationships I made with the phenomenal staff of the lab and hospital.

Update 2014: *I am a rising senior studying Biology at Amherst College. My experience at U of C built a foundation for my experiences in science and spiked my interest in research. I have explored those interests over the last year and plan to continue to do so in the future. I spent this summer looking at companion animal behavioral disorders and will be doing a semester-long research project in animal behavior this fall. I hope to be able to get back into medical research abroad after I graduate and am currently applying for a Fulbright Fellowship.*

Update 2015: *I graduated from Amherst College in May of 2015 with a degree in Biology. I am currently working as an assistant swim coach in Palo Alto while I study for my MCAT, which I'll be taking the first week of August. I start my year of service with City Year in Boston a week after my test date and will be there for the next 11 months while I put together my*

medical school applications.

Anna Zimmer, Carleton College '15

Thanks to the Ted Mullin Fund, I was able to spend the summer working in Dr. Jill de Jong's lab at the University of Chicago. In addition to gaining incredible laboratory experience, I met wonderful mentors and learned about where I want life to take me post-Carleton.

We primarily researched major histocompatibility genes in zebrafish in the hope that understanding these markers will open new doors for cancer research. This summer I learned countless new laboratory techniques while simultaneously learning what a career in science looks like. This research inspired me to strongly consider working in a lab post-Carleton, something I had not thought about before.

The mentors that guided me this summer gave me invaluable advice about medical school, graduate school, and how to make the most of my time at Carleton. They both inspired me and encouraged me to pursue a career in science, whether that be as a researcher or doctor (or both!).

I participated in the Hour of Power at Carleton due in part to my experience working with Dan's House of Hope, a hospitality home for AYA cancer patients and their families. Being able to take part in cancer research at the University of Chicago that will benefit that age group was overwhelmingly satisfying. I encourage all athletes who participate in the 2013 HoP to apply for this internship. I know it sounds cliché, but this experience honestly changed my life and I anticipate that it will continue to do so for years to come.

Update 2014: *This summer I've been working in a lab at MD Anderson Cancer Center that is doing translational research on triple negative breast cancer. I have my experience at the University of Chicago to thank for giving me the confidence to pursue more research opportunities. Being a TMF Scholar also inspired me to take Immunology courses at my college. I'm even doing my senior capstone project on an Immunology-related topic! I can safely say that being a Ted Mullin Fund Scholar opened doors for me not only in terms of summer research opportunities but also in courses that I have taken in college.*

Update 2015: *I graduated from Carleton College in June 2015 and will be headed to Chicago to work for Mercy Home for Boys and Girls for the next year. I'll also be taking the MCAT in a few months and hope to attend medical school.*

Ted Mullin Fund Scholars Summer 2012

Erik Klontz, Carleton College '13

My summer as a Ted Mullin Fund Scholar was a defining experience in my development as a researcher. At the University of Chicago, I was treated more as a temporary staff member than as an intern. Under the excellent guidance of Dr. John Cunningham, I had the freedom to plan my own summer with a combination of laboratory research and clinical exposure as I saw fit. This meant that on a daily basis, I was spending my time exactly how I wanted. As a result, I was involved in a number of different projects, and learned many more laboratory skills than I could have imagined after a single summer of research.

This experience solidified my desire to become a physician scientist. I enjoyed the research, which felt extra grounded by the opportunity to visit patients in the hospital. I am currently taking a gap year while I apply to MD/PhD programs. As part of the gap year, I am spending time at the International Centre for Diarrhoeal Disease Research, Bangladesh, where I have been studying antibiotic resistance patterns in *Vibrio cholerae* and *Shigella*. My experience as a Ted Mullin Fund Scholar helped me to both secure the position and succeed with my research. I believe that the Ted Mullin Fund Scholarship is the perfect opportunity for highly motivated independent individuals with an interest in medical research.

Update 2014: *Since my last update, I've matriculated at the University of Maryland MD/PhD program, where I've spent the summer researching novel therapeutics for infectious diseases. In August, formal classwork for medical school will begin, and I will be officially underway in my 7-8 year dual degree program. I still believe strongly that the experience I gained at the University of Chicago set the foundation for my career as a physician scientist.*

Update 2015: *I've finished my first year of medical school in Maryland's MD/PhD program. This summer, I'm doing my second rotation to find a lab for my PhD. The research involves manipulating glycosylation sites on antibodies, with applications to a wide variety of cancers and autoimmune disorders.*

Ashley Paquin, Carleton College '13

My summer project in pediatric oncology research at the University of Chicago aligned closely with my favorite class at Carleton, a genetics class that I had taken in the spring before starting the internship. My research with Drs. Navin Pinto and Susan Cohn only intensified my interest in cancer genetics and personalized medicine. At the University of Chicago I worked on a project looking at genetic differences in treatment response and disease outcome of pediatric neuroblastoma. Like my mentors, I became fascinated with the fact that some neuroblastomas will go away completely without treatment and some will not respond to even the most aggressive treatments. I spent my summer learning about the complexities of the disease, genotyping samples, and exploring correlations between genetic markers and drug response and cancer aggressiveness. On Wednesdays, my mentors were kind enough to take me with them to the clinic where I got to watch the doctors interact with the patients that they work so hard to cure both in the clinic and in the lab. The combination of research experience and patient care exposure that I gained through this internship solidified my desire to become a doctor.

However, I wanted to gain more research and life experience before applying to medical school. I followed my interest in the genetics of cancer and I applied for research positions at the National Institutes of Health. I was awarded a two year post-baccalaureate intramural research training award through the National Cancer Institute working with Dr. Ludmila Prokunina-Olsson, and I have no doubt that my prior experience working on cancer genetics at the University of Chicago was a major factor in my acceptance. I am working on a similar project now with bladder cancer where I am looking at genetic markers to explore risk of bladder cancer progression. My work at the University of Chicago ignited an interest in this field and helped me gain a more permanent position where I can further

develop my research skills and translate my knowledge into my future career. At this point, I am most interested in working in pediatric oncology where I can treat patients and continue to do research on the genetics of cancer.

Update 2014: *I am currently in my second year as a post-baccalaureate cancer research trainee at the National Cancer Institute in the lab of Dr. Ludmila Prokunina-Olsson. Similar to my work as Ted Mullin Fund Scholar, I am working on genetic studies to improve cancer treatments and outcomes. I am also applying to medical school. My experience at the University of Chicago greatly influenced both my decisions to work in the field of cancer genetics research after college and to apply to medical school. I was greatly inspired by the quality of research and patient care exhibited by all of the doctors that I worked with, and this shaped my goals for how I want to practice medicine in my own career. Though I will not need to decide for at least four more years, I am most interested in specializing in pediatric oncology where I could see patients and also work on biomedical research.*

Update 2015: *I graduated from Carleton College in 2013, and worked at the NIH in the lab of Dr. Ludmila Prokunina-Olsson until the end of May, 2015 on bladder cancer genetics and IFNL4, a gene discovered in relation to liver cancer. I will start at Mayo Medical School in July. Ever since my experience as a Ted Mullin Fund Scholar under the guidance of Drs. Navin Pinto and Susan Cohn, I have been interested in cancer genetics and personalized medicine. At this point, I plan to pursue a career in pediatric oncology. I am incredibly grateful for the support of the Ted Mullin Fund for setting me on this career path.*

Aleks Penev, University of Chicago '13

My interest in stem cells was piqued in high school and has only grown since. My past research, including my summer as a Ted Mullin Fund Scholar at the University of Chicago Medicine, involved using induced pluripotent stem cells as a model system to study the impact of erythroid transcription factors on hematopoietic cell differentiation and development. My interests now lie in stem cells' potential for tissue regeneration and even organogenesis.

Update 2014: *I am currently an MD/PhD candidate at NYU Langone*

Medical Center where I continue to pursue my interest in stem cell research and its potential for regenerative medicine.

Update 2015: *I am currently an MD/PhD candidate at NYU Langone Medical Center where I continue to pursue my interest in stem cell research and its potential for regenerative medicine.*

Tony Restaino, University of Chicago '15

Acceptance and participation in the Ted Mullin Fund Scholars program introduced me to a number of unique experiences that I don't think I would have experienced in any other program. It introduced me into the world of laboratory sciences in the field of cancer biology, learning different scientific techniques and procedures that I never would have learned in a classroom setting. I was introduced into more of the rewarding, but nuanced, parts of science, which provided a unique prospective on both the work that I took part in during the internship, and also the work that I have been fortunate enough to continue in the same lab since then. Most importantly, the program provided insight into what it is that I enjoyed about this particular field in science, and provided further evidence for what I want to pursue both in school and after graduation.

Update 2014: *I am starting my final year at the University of Chicago, majoring in Biology with a specialization in Cellular and Molecular biology. I have continued working in the de Jong lab, the lab I interned in as a Ted Mullin Fund Scholar in 2012, where I am now completing my senior thesis comparing the genetics of HDAC heterogenous knockout and wild type T-cell acute lymphoblastic leukemia. Along with entering my final year at school, I am also starting my last season of diving. I am completing applications for graduate school, looking to start the fall after graduating from the U of C.*

Update 2015: *This past June I graduated from the University of Chicago with a degree in Cellular and Molecular Biology, where I completed my senior thesis on the role that HDAC1 plays in regulating the genetic expression of T-cell Acute Lymphoblastic Leukemia, a topic I started researching during my Ted Mullin Scholar Internship in Dr. Jill de Jong's lab in 2012. This coming fall I will start graduate school for a Masters degree in Medical sciences at Boston University.*