

Yale applicant majoring in Molecular, Cell Biology, and Developmental Biology who applied to the Keck Graduate Institute SURE program

After searching for a science research opportunity this summer, I became interested in the Summer Undergraduate Research Experience (SURE) at Keck Graduate Institute because it stood out as an interdisciplinary program that expands beyond the laboratory bench. While I was drawn to this institute's renowned facilities and support for biotechnology research, I am also interested in the business and ethics resources provided by Keck and the focus on women and minorities in science. The previous year, I was able to participate in a summer research program hosted by my university whose goal was also to provide support for women and minorities in STEM, so learning about such issues while performing research was an exciting experience for me in terms of assessing the social impacts of the scientific community.

My current studies are in biochemistry and biophysics, where my previous research experience involves genetic engineering and molecular biology, with a focus on DNA repair systems in bacteria and yeast. As I have progressed through my undergraduate education, I have become more invested in pursuing science research as a career and hope to gain the valuable experience necessary to reinforce my decisions and to aid my growth as a scientific researcher. After my undergraduate education, I plan to apply to graduate school to pursue research in genetics or a related field. Currently, I am unsure if I would instead want to pursue a medical degree with a focus on clinical research, specifically with genetic causes of diseases. I hope to gain more experience to decide which path is most suitable for me, which is why a research experience with the Keck Graduate Institute SURE Program would be instrumental in my decision.

As previously acknowledged, another reason why I would be excited to attend the Keck SURE program is due to Keck's commitment to women and minorities in STEM, where I have been involved with gender bias issues in science and academia since learning about it in high school. Having started a partnership between my university and the Association for Women in Science (AWIS), I am always excited to work with institutions dedicated to increasing diversity in science, and the Keck Graduate Institute has been of interest to me due to its involvement with these concerns. The ability to conduct research in science with an understanding of where my work lies in the context of society—both related to scientific developments and social factors—has been important to me as I continue my academic advancement, and I appreciate the work that the Keck Institute has done to improve such issues.

After learning about the KGI SURE Program, I was excited about the way it is organized and the focus on guided mentorship in science. I am especially interested in conducting research at this institution because of the resources offered for skills development in both presentation and research techniques, two subjects I find crucial in conducting and explaining my research to others. The ability to work under a mentor and to communicate project ideas with other SURE students is

also exciting because it bridges my interests in learning both from established researchers and my own peers. Having these resources available to me is a privilege that I would look forward to in dedicating my summer, and I would be very excited to work at the Keck Graduate Institute this summer because of its established commitment to science research.

SUPPLEMENTAL ESSAY on Research Interests

My current research interests include genomics and genetic engineering. Before becoming involved with genetics, I wanted to do scientific research but was unsure of the field. While biochemistry was the overall subject I was committed to, my excitement for genetics did not develop until I joined my university's international genetic engineering machine (iGEM) team during my freshman year of college. Our project focused on the optimization of multiplex automated genome engineering (MAGE) in non-model microorganisms, specifically two strains of nitrogen-fixing rhizobia. Both the independence of designing and troubleshooting our project and the collaboration with other international iGEM teams helped cultivate my passion for genetics research as a means to discover and apply growing knowledge about gene editing techniques. Furthermore, the Keck Institute had provided DNA synthesis material for participating iGEM teams the previous year, so being able to work with this institute this summer would be a rewarding way for me to stay connected with the support that was provided to our iGEM team.

I am also working in a biochemistry laboratory investigating the genetic factors of DNA repair systems, specifically of non-homologous end joining (NHEJ) and break-induced replication (BIR). Our current project involves identifying the role of a subunit of human DNA polymerase delta complex on break-induced replication. This position has exposed me to another application of genetics research, where I have come to appreciate the wide importance of genetic engineering in both environmental issues and human health. Being involved with this work also influenced my desire to apply to the KGI SURE Program because of the research available in the fields of biotechnology and genetics—fields that I wish to contribute to as a student researcher.

As such, the scientific area I am most interested in is genetics, including gene therapy and genetic engineering; I am also interested in chemical biology, biophysics, and immunology. The field of genetics is one where I have the most experience and passion in investigating, and I believe it is an area of science where I could contribute my most meaningful research. Translating my interests to the summer research projects available at the KGI SURE Program, the one project that excited me the most is Dr. Ilya Tolstorukov's project of developing a "novel vector for the *Pichia pastoris* expression platform" (Project #8). What drew me into this project was the proposed use of an expression vector for pharmaceutical and

environmental applications—such as producing biofuel enzymes and animal feed proteins—because much of my prior exposure of expression systems never focused on applications like these, so working with this established technique in novel applications would be instrumental to my continued development in learning about genetics research.

I would be suitable to work with this project because I have past experience with attempting optimization of vector systems in various organisms—most notably my past iGEM experience in optimizing the pORTMAGE-3 system from *E. coli* to non-model rhizobia (*R. tropici* and *S. meliloti*). I also have experience with the background knowledge needed, including DNA manipulation, restriction digestion, molecular cloning, and PCR analysis. More importantly, I would aim to use the research experience from Dr. Tolstorukov's project to learn more about plasmid manipulation and constructing protein-expression strains with the *P. pastoris* model.