**Personal, Relevant Background and Future Goals Statement**

Name: Brandon Barker

Application Link: <https://astrobarker.github.io/essays/nsf_grfp_research.pdf>

Personal Statement Link: <https://astrobarker.github.io/essays/nsf_grfp_personal.pdf>

**Personal Statement**

As a first generation college student who grew up in a rural community, raised by a single mother in a lower class household, each stage of life has produced new obstacles directly related to my background. Upon my entry to university, I was already at a distinct disadvantage compared to my peers, who had far more resources available to them previously. My high school was small and, unfortunately, lacked any advanced science and mathematics courses such as basic calculus. This combination of factors made my adjustment to university honors coursework difficult. These struggles, however challenging to overcome, have helped to shape me into the industrious student I am today. Navigating and eventually learning to succeed in the university setting with my background has helped to curate my interests and fortified my desire to achieve a career in astrophysics. I will pursue a Ph.D. in astrophysics followed by postdoctoral research and eventually a teaching and research position at a university. Alongside my career, I will continue my involvement in scientific outreach while advocating for educational equity and equal rights of marginalized groups within academia.

**Personal Statement - Intellectual Merit**

Having grown up in rural Tennessee, with the night sky laid bare, I knew when I went to college that I wanted to learn more about astrophysics research. It was to this end that in the spring of my freshman year I sought out Dr. Anthony Mezzacappa. Over the course of the semester we had several meetings discussing his research into the explosion mechanisms of core-collapse supernovae (CCSNe). These meetings culminated in a fully funded summer research experience at the Joint Institute for Computational Sciences at Oak Ridge National Lab (ORNL).

This research project focused on evaluating the role of turbulence in the revival of the stalled shock that drives a core-collapse supernova. Previous [4] and recent work [3] had shown that turbulence played a significant role, but we wished to further quantify that statement. I created analysis software that decomposed the fluid fields to better understand the dominant effects present. For two weeks I struggled with errors and null results. Finally, late one night, I had a small, yet life-changing, breakthrough as I had finally created a working version of the code. The euphoria that followed after I visualized the results of the analysis for the first time was a feeling that I will not forget. This victory, however small, had a profound effect on me: I had created a tool that would be used by myself and other scientists to analyze simulation data. Moments like these have continually inspired me to pursue a career in research. Unfortunately, as is often the case, this research project did not produce the results originally planned. After a considerable amount of time, several conferences, and numerous presentations, our new analysis technique produced few useful results. While this certainly was disheartening, I did not let it deter me from my goals. My first research experience had provided me with countless insights into research and introduced me to the joy of discovery and, yes, it had also showed me the less glamorous side of research. As a result, I have come to appreciate the excitement of discovery, but also the failures that will inevitably accompany a career in research.

After the end of my first research project analyzing simulation results, I wanted to gain a better understanding of the inner workings of CCSNe simulations. To this end, I began working with Dr. Eirik Endeve, a staff scientist at ORNL. This project has involved the development of new hydrodynamics algorithms utilizing more advanced numerical methods than those commonly used in the field. My contribution to the project focused on generalization of the code to a nuclear equation of state (EOS). This demanded an intimate knowledge of numerical analysis and stellar structure. From this project I have gained extensive exposure to advanced computational methods that far exceed the scope of undergraduate courses. This work has resulted in a forthcoming publication submitted to the Journal of Physics: Conference Series (proceedings of Astronum 2018).

By my junior year I had acquired ample exposure to supernova theory and computational methods and wished to expand my horizons. I applied to numerous domestic and international summer research programs including the Department of Energy - Instituto Nazionale di Fisica Nucleare (INFN) Student Exchange Program. I was one of 11 students selected to participate in research projects at various INFN national lab locations around Italy in the summer of 2017. In my work under Dr. Barbara Patricelli and Dr. Massimiliano Razzano, I estimated joint detection rates of gravitational waves (GWs) and gamma ray bursts from binary neutron star mergers. Just two weeks after the conclusion of my program, the first joint detection of GW and gamma ray signals was made with GW170817 [1]. This project introduced me to the new and exciting field of multimessenger astronomy while developing my data analysis skills. My contributions to this work led to my selection as a 2018 Barry Goldwater Award Honorable Mention.

This summer I was chosen for the Advanced Computational Research Experience 2018 REU program at Michigan State University. I worked under Dr. Sean Couch exploring the sensitivity of CCSNe to variations in input nuclear physics characterized by uncertainties in nuclear physics at astrophysical densities. This project was the culmination of all of my previous experiences; I used a new model for driving explosions in 1D that included crucial effects of turbulence, I was able to apply my knowledge of computational methods, and I studied the effects of the nuclear EOS on the multimessenger signals produced in great detail. My experience here has affirmed the notion that I wish to study CCSNe in graduate school and will result in a publication in The Astrophysical Journal.

I have worked with several leaders in the field of supernova theory. Under their guidance I have become intimately acquainted with the current status of the field and, when combined with my other experiences, am well posed to begin graduate work. I have also partaken in numerous opportunities to present my work at the local, regional, and national levels, thus allowing me to greatly develop my communication skills.

**Personal Statement – Broader Impacts**

I entered the university setting with no understanding of how to succeed in academia. I have been fortunate to have had mentors at various stages of my undergraduate career guiding me, though many are denied this mentorship. Through this I have learned the necessity of proper mentorship, and as such, am dedicated to mentoring the next generation of scientists. Therefore, I have made considerable efforts to engage with both the campus community and the general public. My involvement with organizations such as the Society of Physics Students (SPS), Women in Physics, Pipeline: Vols for Women in STEM, and Ask a Scientist have given me an exceptional platform for science communication through public demos, events, and school visits. In particular, I am interested in outreach focused around first generation students from rural communities, who are often overlooked despite the unique challenges that they face. In the U.S., 29.8% of adults over age 25 have a Bachelor’s degree or higher; while in rural Appalachia, it is only 15.9%.1 This trend is certainly not unique to Appalachia. Often, rural students do not see a college education as an attainable goal. Research [2] has shown that as high as 1 in 5 low income high school graduates unenroll 1 https://www.arc.gov/assets/research\_reports/DataOverviewfrom2011to2015ACS.pdf from college during the summer following graduation due to a lack of support. Furthermore, those that do attend college have difficulties adjusting and are more likely to drop out in their first year than other students. For these reasons, I am committed to supporting first generation and low income students in their transition to academia.

During my first semester of college I began participating in Saturday Science, a program jointly organized by our chapter of SPS. Here, volunteers from various fields and backgrounds go to Pond Gap Elementary, a local Title I community school, to conduct hands on science experiments and activities with the students. Most of the students participating in the program are from underrepresented groups including those from low socioeconomic backgrounds, students of color, and refugee families. Programs like this are absolutely critical to promoting science among marginalized groups to give them the resources that they deserve, and it was through this program that I found my passion for outreach.

According to the National Survey of Student Engagement, participation in undergraduate research by underrepresented groups is positively correlated with higher retention rates, persistence to graduation, and motivation to pursue graduate education. My initial involvement in research gave me a sense of belonging and accomplishment that was vital to my long term success. Therefore, commitment to undergraduate research has been a pivotal part of my outreach mission. I have joined the executive boards of Pursuit - The Journal of Undergraduate Research at the University of Tennessee and the Undergraduate Research Students’ Association (URSA). Pursuit is a peer-reviewed undergraduate research journal open to all disciplines allowing students the opportunity to publish their work. My responsibilities have included leading a peer-review team and screening all Sciences and Engineering submissions for plagiarism. Meanwhile, URSA promotes undergraduate research across campus, hosts an annual research symposium, and has advocated for the inception of an undergraduate research fund. Resources such as these are key to connecting students to research opportunities; as a freshman, I wasn’t even aware that research was something that was available to me, and it was these programs which opened that door. These activities have given me the opportunity to promote undergraduate research directly to students who have the most to gain.

**Personal Statement – Future Goals**

As I move forward in my career I will continue to develop my research and communication skills while becoming more involved in science outreach and education. I hope to join the SNAPhU research group under Dr. Sean Couch at Michigan State University to investigate electromagnetic signals generated by core-collapse supernovae. This, combined with ongoing work in the research group on GW and neutrino signals from CCSNe, places the group’s work firmly within the context of the new field of multimessenger astronomy. A career in academia is about more than just doing and communicating research; as scientists we have a responsibility to nurture the next generation of scientists from all backgrounds. It is important to me that I succeed at both of these goals, and the NSF GRFP will give me the resources and support that I need to do both effectively.

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Application Link: <https://drive.google.com/file/d/1ObuHEI6GgO4_Qf7S_fJTDV6HbFXYaPM4/view>

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**Personal Statement – Personal Background**

For a kid passionate about biodiversity, Chicago was a good place to grow up. I spent more weekends than I can count at either the Shedd Aquarium or the Field Museum of Natural History, located ~500ft from one another on Chicago’s Museum Campus. Even then I found visits more rewarding with an audience. I spent almost every birthday of my childhood at either the aquarium or museum, rattling off fun facts and natural history tidbits as I played tour guide for my friends. It wasn’t long before I moved to the other side of the glass, spending summers and weekends as a guest engagement volunteer at both institutions. I was also fortunate enough to work behind the scenes at the Field Museum, identifying and preparing samples in both the mammal and marine invertebrate collections. In the summer of 2011, I was accepted into the Shedd Aquarium’s High School Marine Biology program that gave me my first field experience in the form of a week-long research cruise on the R/V Coral Reef II. Together these two institutions provided me with a robust scientific toolkit as well as a vehicle for sharing my passion with others. More than anything these early opportunities gave me an appreciation for the immense amount of animal biodiversity on earth.

Personal Statement - Intellectual Merit

My research interests are best characterized by a desire to understand relationships across animals and the evolutionary processes that produced them. To me, this means working with marine invertebrates because of the 35 commonly recognized animal phyla all but 2 exist in the marine environment and over half reside there exclusively. In addition, many invertebrate groups are also severely understudied relative to their diversity. Surprisingly, vertebrates represent 55% of animal species with sequenced genomes despite representing just 4% of animal species total1  . I was able to take advantage of multiple opportunities working with marine invertebrates early in my career at the University of Miami, which I attended as a marine science & biology double major on a Presidential scholarship. I participated in several projects at the University of Miami Experimental Hatchery, where I was introduced to the recent and ongoing debate over our most distantly related animal relative: sponges or ctenophores? I was excited and challenged to learn just how much is left to discover about even the biggest questions in animal evolution. I also gained an appreciation for the relationship between biodiversity and evolution, how increased sampling across species provides resolution to our understanding of evolutionary relationships and processes.

Upon returning from study abroad in the Galápagos in the spring of 2016, my professor, Dr. Lynne Fieber, said that while she didn’t have the time to mentor another student directly, she would allow me to use some of her experimental animals (the sea slug Aplysia californica) and resources for an independent research project. I spent several days reviewing literature, developing a question and an experimental method to explore it. I designed sets of behavioral trials to observe mating strategies within a cohort of A. californica while altering food availability in order to study mating role choice. I discovered that animals were more likely to act as males when paired with a partner who was better fed. I presented my findings at the RSMAS Undergraduate Research, Creativity, and Innovation Forum and was also featured in a science radio segment at Northwestern University. I was able to publish this work as first author in the Biological Bulletin. This experience was crucial in developing my independent  thinking skills and learning the ropes of the scientific method firsthand.

Not until near the end of my undergraduate career did I realize the importance of molecular data in resolving some of the oldest and most controversial animal relationships that I was interested in studying. Coming from a more organismal background, I did not feel I had the appropriate skills and knowledge to excel in a phylogenetics graduate program. I decided to take a gap year to return to the Field Museum to work in the Pritzker DNA Lab where I developed molecular skills with Sanger as well as massively parallel (Illumina) sequencing platforms. I was able to apply my new molecular skills to a biogeographical analysis of a South American cichlid resulting in my second publication.

After my gap year, I joined the Halanych Lab at Auburn University with a Peak of Excellence Graduate Fellowship for my first year. Within my first year, I published a short first author paper4 on the mitochondrial genome of a marine worm, Dinophilus gyrociliatus, and have two additional first author manuscripts in preparation. The first (Molecular Biology and Evolution, in prep) is a gene evolution study comparing differences in selection pressure between genes following duplication vs. speciation events. I presented this work at the 2018 Society of Systematic Biologists standalone meeting and will present at the Society for Integrative and Comparative Biology meeting in 2019. For the second paper5 (currently under consideration at Nature), I was interested in species representation in high-throughput sequencing experiments. Surprisingly, I found that species evenness has been decreasing steadily over time, with more experiments focusing on relatively fewer species. This highlights the need to increase sequencing efforts on understudied groups to improve our understanding of animal diversity and evolution. This past summer, I was selected to participate in the Workshop on Molecular Evolution at the Marine Biological Laboratory. There I received intensive training in the latest phylogenomic methods and was able to discuss my research with many pioneers in computational molecular evolution. I am eager to take what I have learned about species and gene tree inference and apply it to large unresolved questions in animal evolution. Each of these projects and experiences have helped lay the groundwork to my proposed research exploring phylogenomic relationships and gene duplications in an enigmatic and understudied group of marine worms (see Research Proposal).

**Personal Statement - Broader Impacts**

I have long maintained a commitment to science communication. My background in museum and aquaria outreach has shown me how biological specimens can bridge the gap between hard science and an engaged public audience. As president of the University of Miami Aquarium Club, I learned that local organisms displayed in a natural setting can serve as ambassadors for conservation. Many people aren’t aware of the breadth of local biodiversity and are much more likely to care when introduced firsthand. Through outreach I was able to almost double the membership of the club while president. During my semester abroad in the Galápagos Islands, I volunteered at the Tortoise Breeding Center. In addition to helping the tortoises directly I was also able to interact with tourists and locals to raise awareness for this unique and vulnerable species. As with my work at the Shedd, Field, and Aquarium Club, I learned to use specimens as a tool to foster engagement and education with a public audience.

As a graduate student I am increasing my efforts toward science communication. For the previous two semesters, I have been an active participant in Skype a Scientist, a program that matches researchers with K-12 classrooms all over the world. This provides a great opportunity for science education and also gives younger students an idea of what being a scientist is like. Last spring I used specimens collected by my lab to teach basic evolutionary concepts (homology vs. analogy, extinct vs. extant, sister groups). Afterward the teacher asked if I would consider meeting with the other 3rd grade classes as well. In one class some students even decided to skip recess in order to talk with me a little longer. I currently meet with 2-4 classes a semester; however with a GRFP award I would be able to increase this number up to 8- 10. Online outreach is an effective way to disseminate science education to a wide audience; however, it is no substitute for local engagement. According to a 2010 census my county (Lee  3  County, AL) is 23% African-American and 22% impoverished, two demographics that have been historically excluded from STEM higher education. According to the National Assessment of Educational Progress, Alabama ranks #46 in scientific literacy for 4th graders and #49 for 8th graders. Alabama is also part of the Established Program to Stimulate Competitive Research (EPSCoR), meaning it is targeted by the NSF in order to improve STEM capability and capacity. The lack of science education in Alabama is perhaps surprising given that Alabama is also one of the most biodiverse regions in the U.S., with more freshwater fish, mussel, snail, crayfish, and turtle species than any other state. Unfortunately, Alabama is also home to 123 endangered species according to U.S. Fish & Wildlife, the third highest in the country.

Exposure to biodiversity through both living and preserved specimens was crucial to my development as both a scientist and conservationist. In an effort to provide others with similar experiences I have worked closely with the Auburn University Museum of Natural History in open house and outreach events in an effort to educate local communities on the diverse and imperiled animal groups living in their own backyard. Last fall, I helped run the Destination STEM program, an interactive experience for Alabama middle and high school students to engage and meet with researchers. I educated participants using specimens from the invertebrate collection, including both local freshwater species as well as deep-sea specimens they would be unlikely to see in a zoo or aquarium.

Financial support from my degree program requires a teaching assistantship on-campus at Auburn University. A GRFP award would allow me to devote more time to education and outreach efforts directed at K-12 students locally and abroad. One program I would be able to participate in is the Summer Science Institute (SSI), an advanced STEM program for gifted 11th and 12th grade Alabama students from underrepresented backgrounds. Dr. Rita Graze from the Department of Biological Sciences at Auburn has received funds to expand the program as part of a new CAREER award. I will run a biodiversity and phylogenetics module as part of the SSI. Students will create their own phylogenies from morphological characters of biological specimens and compare and contrast them with trees inferred from molecular data.

**Personal Statement - Future Goals**

I am motivated by a desire to understand the evolutionary patterns and relationships that contribute to the incredible amount of animal diversity we see on earth today. I believe this goal is best accomplished through broad, comprehensive sampling. However, my recent research has shown that despite having access to more genetic data than ever before, molecular research is still largely biased toward the same small minority of species. Throughout my career, I aim to address this imbalance by sequencing understudied organisms in order to gain a greater understanding and appreciation of animal evolution. This goal is paired with an intense desire to share my passion with others, particularly those who have not yet had the exposure to biodiversity that I benefited from early in my career. I believe an engaged, hands-on approach is the best way to improve scientific literacy and raise awareness for conservation. My long-term goal is to become a curator of invertebrates at a natural history museum that would grant me access to a wide variety of specimens for research in addition to allowing me to focus outreach toward a public audience. A GRFP fellowship would be instrumental to helping me achieve these goals.

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Application Link: <https://drive.google.com/file/d/1gjzHrwICVaKbSoAjNOEPkdXKwtdejx65/view>

Personal Statement Link: <https://drive.google.com/file/d/1MwGxOmYkasQTnJ0znHy4iQRGq61I2j1s/view>

**Personal Statement**

I doubt my parents could have predicted the profound impact fairy tales would have on my life. But now, as a second-year Ph.D. student studying Human Computer Interaction (HCI) at UC Berkeley, I work on bringing the ideals from my childhood to life every day by making Computer Science (CS) Education more accessible and approachable. Fairy tales instill a deep sense of fairness, which I strive to bring to the world around me. Inspired by “The Brave Little Tailor,” I view education as a way to respect the power of cleverness and intelligence. As in “Cinderella,” I believe everyone should have the opportunities to pursue their desires on their own merits regardless of their environment by increasing access to education. Specifically, my goals are to make education more accessible, eventually revolutionizing people’s relationship with knowledge.

**Personal Statement – Research Background**

I developed an interest in research as an undergraduate student at New York University, where I studied math and computer science. I wrote my undergraduate thesis on Parakeet, a system on which I collaborated with 2 graduate students. Parakeet was designed to bring computational efficiency to the existing high usability of Python by automatically accelerating data-parallel algorithms (e.g. most Machine Learning algorithms fit this description). This work was published at USENIX’s HotPar Workshop [1]. One aim of this project was to help researchers run algorithms more quickly without being experts in parallelization, automating optimizations for them. I independently focused on the Python interface, recognizing its ability to make Parakeet widely usable. Specifically, I programmatically transformed Python Abstract Syntax Trees into a unique intermediate language, finding semantic transformation rules between the two languages. On Parakeet, I focused on making specialized techniques more accessible.

After graduating, I wanted to build my practical coding skills and chose to work at Google on Distributed Denial of Service (DDoS) defense. DDoS defense focuses on identifying non-human web requests, assessing and distinguishing between human and non-human behavior. Throughout my time at Google, I was working on previously unsolved challenges that were cutting-edge due to the magnitude of traffic. In one particular project, I improved upon the interaction Google employees had with configuring DDoS defense settings for their projects. When I joined, all services (e.g. Gmail, YouTube) explicitly configured parameters representing their expected traffic to help detect large-scale non-human traffic. However, this configuration was based on complex mathematical models that were challenging to understand, resulting in most employees configuring them incorrectly. I worked in a team to create a set of configurations based on more understandable parameters. To develop this, we first observed human traffic patterns and categorized them, investigated a sample of services with representative but disparate usage patterns, created new algorithms to support each of these patterns, and found defensible ways to measure the new algorithms’ impact. Nearly every service at Google moved over to one of our new configurations after we created them. At Google, I again focused on investing in computational design to minimize the expectation on users to understand and apply specialized knowledge.

After 2 years at Google, I joined a team at Airbnb focused on user growth. At Airbnb, the product itself builds connections between people, fighting divisive stereotypes. Our team regularly generated hypotheses through user studies, formal interviews, and analysis of passively-collected data. Based on this data, we designed and implemented large-scale A/B tests, designing and analyzing metrics to determine the success of the implementations. At Airbnb, I ran hundreds of controlled web experiments to better understand the users. Airbnb is where I truly feel I started to become an HCI practitioner, though I was still unsatisfied that my work wasn’t rigorous enough to advance knowledge in academic communities; it was often very specific to Airbnb and their users.

To grow my potential to advance knowledge, I began my Ph.D. at UC Berkeley in HCI, advised by Armando Fox and Marti Hearst. In my first year, I have honed my skills as an HCI researcher through my formal classwork, leading sections as a Graduate Student Instructor (GSI), and my research.

Diving into research, I wanted to create systems that would support students in writing code that is concise, elegant, and revealing of design intent. This is a critical but underdeveloped skill in industry, and I was excited to explore how students learn. My first steps involved extending Autostyle, an Intelligent Tutoring system [2]. Students using Autostyle first generate a correct solution to a problem themselves, then receive automated advice to use or avoid certain programming language features. I collaborated with my advisors, leveraging my HCI expertise, to design and run two formative studies (n=6, n=5) to more deeply understand how to improve the range of students that could benefit from Autostyle.

I first explored students’ ability to generate human explanations of various approaches to a problem to see if, at scale, these could supplement the automated hints. I found that students struggled to generate meaningful explanations unless they first generated multiple solutions to a problem, a task that requires significant time and effort. I presented the study findings on this at BayLAN, the Bay Area Learning Analytics Conference. Based on the findings from this first study, I became interested in how students could engage with given solutions with less effort.

I found Parsons problems, or unscrambling lines of code into a correct solution, as a novel opportunity to address this challenge as these problems have similar learning gains to generating code [3]. In my second formative study, participants interacted with Autostyle, but began by solving a Parsons problem instead of generating their own solution. Compared to the previous Autostyle studies, participants were able to make substantial refactors to their initial solutions. This study has led to a follow-up study (n=3) and motivated my future research direction, leveraging new styles of problems to make CS accessible to a wider range of people. Leadership Experience Even as the most junior employee on my team at Google, I was responsible for developing and delivering quarterly goals for DDoS defense. I met with the 3 main stakeholders and synthesized their feedback and priorities into realistic quarterly goals.

Within my first year at Airbnb, I was elevated to be the technical lead for my team, owning the services’ maintenance and continued development. I led a team of 4, scoping tasks that were impactful, aligned with their interests, and supported their technical growth.

Beyond technical leadership, at Airbnb I also founded and led AirPride, Airbnb’s global LGBTQ Employee Resource Group (ERG), to ensure an inclusive environment within Airbnb and leverage Airbnb’s resources to support the LGBTQ community. This was the 2nd ERG formed at Airbnb, and helped set policies to enable the additional 10 that now exist. Through AirPride, I co-hosted fundraising events with other companies, ensured Airbnb scored 100 on the Human Right Campaign’s Corporate Equality Index, advised Airbnb’s executive team on the LGBTQ employee experience, and led an effort to include pronouns in email signatures. I am continuing mentorship at UC Berkeley by working with 2 undergraduate students to grow their skills in reading papers, designing studies, and writing robust code.

**Personal Statement – Broader Impact and Teaching Experience**

I’ve always thought that teaching – the process of unlocking knowledge and skills for others – is an incredibly valuable use of time. At NYU, I conducted study sessions for my peers, reviewing lecture material and challenging homework problems. I sought out opportunities for more teaching opportunities at Google, where I formally mentored new hires, taught several day-long classes on Python, and created a bi-weekly team meeting for my team to teach skills to each other. I continued to expand the scope of my teaching at Airbnb. I continued mentorship, developed and taught classes to new hires, developed and taught classes on git to non-engineers, and co-led trainings on ally skills to create a more inclusive environment. At UC Berkeley, I have continued to lead trainings on unconscious bias and ally skills with Bias Busters, and led a team of 4 Graduate Student Instructors teaching 80 students in an upper-division CS class.

I strive to create supportive environments. After experiencing the limited onboarding experience at Airbnb, I was inspired to create onboarding process to support new employees intellectually as well as emotionally. I was part of a small team that designed and built out a 3- week onboarding curriculum for new software engineers, and I led a cohort of 24 new hires through this curriculum. I also built a light-weight, searchable internal thesaurus tool for employees to look up commonly used terms and acronyms. By the time of my departure, all new hires were using this tool. I am also passionate about equity and am deeply aware of ways bias is perpetuated in social systems. For example, the unspoken understanding is that companies require applicants to have only half of the listed job requirements for engineering roles. This deters applicants that may not have access to this cultural knowledge. To combat this, I designed and led interview workshops through Airbnb for Black, Latinx, and LGBTQ students, sharing unwritten rules and giving advice on preparing for interviews. I also mentored students through Out for Undergrad, an organization helping “LGBTQ undergraduates reach their full potential.”

At UC Berkeley, I proposed the idea for and worked with a team on a class project studying gender bias in pair programming. We developed an innovative technique to run a within-subjects experiment measuring the effect of the perceived gender of one’s partner when pair programming. We are currently extending this project to investigate ways to mitigate this bias, with plans to submit to CHI, a top-tier HCI conference. Future Goals I’ve repeatedly seen first-hand the difficulties of effectively sharing technical information. From mentoring, I learned that CS and math concepts need to be explained in a way that resonates with someone’s unique background. From my time in industry, I saw how poor or missing documentation creates a dependence on tribal knowledge, giving more weight to imbalanced social structure. These limitations all reduce access to the knowledge people need, disproportionately impacting some groups of people.

During my PhD and future career, I will leverage my skills to continue improving how people can use technology to learn from each other. Technology has redefined how we construct and share knowledge, but pedagogy research will illuminate the structure and style needed to share it effectively. My work at Google and Airbnb have taught me how to build reliable, extensible software systems leveraging open-source technology and used by billions of people. My Ph.D. will give me the skills to tackle this challenge with novel approaches and contribute to scientists’ shared understanding of how technology can make knowledge more accessible to all people. After graduating, I plan to work in industrial research to best balance my ability to study novel methods for sharing knowledge with the ability to translate the results to systems that directly impact people at scale.