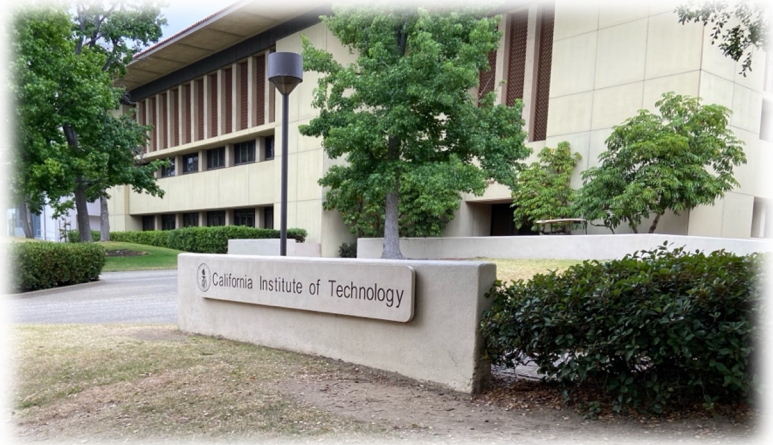


## Reflections on My Caltech SURF Experience

Parry Luo

I would like to begin by expressing my deep gratitude to my Caltech mentor, Professor Harry Atwater, for offering me the invaluable opportunity to participate in the Summer Undergraduate Research Fellowship (SURF) program. His insights and support throughout my research journey were crucial in shaping my experience, and I am incredibly thankful for the chance to work under his mentorship. As a student from National Taiwan University (NTU), this opportunity provided me with an international perspective on research, and I would also like to extend my gratitude to NTU for introducing me to pursue this program, an extraordinary experience that has had a significant impact on my academic and personal growth. Participating in the SURF program at Caltech has been a transformative adventure, not only in terms of expanding my knowledge but also in helping me understand how research in the U.S. operates.

When I first arrived in the U.S., I was immediately struck by the cultural differences. The architecture, the pace of life, and even the way people interact felt different from what I had known. It was an exciting and enriching experience, but it also came with its fair share of challenges. Language, in particular, was a significant barrier. Although I am proficient in English, I quickly realized that communicating in a research setting, especially in technical discussions, was more challenging than I had anticipated. There were moments when I struggled to express my ideas clearly, or to fully understand the subtle nuances of what was being discussed. However, these challenges were also opportunities for growth. I learned to adapt, to ask questions when I didn't understand, and to work on my communication skills.



This was also my first time conducting research outside of my home country and my first time in the U.S., which made the experience all the more exciting. The 10-week program, although short, was filled with valuable lessons and unforgettable moments. I had the chance to witness firsthand the differences between academic environments in the U.S. and Taiwan, both in terms of culture and research styles. While I was aware that language could be a challenge, it was more significant than I had anticipated. However, despite the language barrier, I gained a deeper understanding of how research is conducted in the U.S., and this experience might shape my future career plans.

My research project during the SURF program focused on NiPS<sub>3</sub>, a novel 2D antiferromagnetic material with exciting potential for advanced photonic applications. The project

aimed to fabricate devices that could measure the conductivity and investigate the electronic-spin coupling behavior of this material. Working on NiPS<sub>3</sub> was a unique and challenging experience, as this material exhibits interesting magnetic properties, particularly its excitonic linewidth, which could lead to groundbreaking applications in next-generation solar technology.

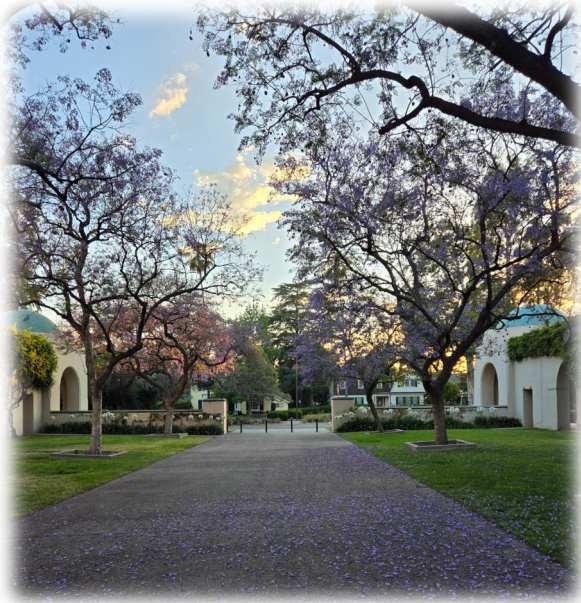


The research process involved several advanced techniques, such as photolithography, electron-beam evaporation, mechanical exfoliation, and two-dimensional (2D) material transfer. I worked with gold contacts deposited onto SiO<sub>2</sub>/Si wafers, ensuring that the devices were ready for electrical measurements. Although we did not achieve significant breakthroughs in terms of results, I gained practical experience in device fabrication, and I am now more comfortable with various experimental techniques. This hands-on experience has been invaluable and has improved my lab skills significantly. It also provided me with a deeper understanding of the intersection of materials science and condensed matter physics, which I find fascinating.

Looking back on these 10 weeks, I realize that the value of this experience lies not only in the research itself but also in the lessons I learned about collaboration, communication, and persistence in the face of challenges. There were many moments when things did not go according to plan, and it was sometimes frustrating not to obtain the results I hoped for. However, working with my graduate student co-mentor, Miles Johnson, and other senior group members allowed me to learn how to navigate setbacks in research and maintain a positive attitude throughout the process. They encouraged me to keep going and reminded me that even in the absence of immediate results, the learning process is equally important.

In addition to the technical skills I developed, I also became more familiar with the U.S. research environment. I had the opportunity to engage with researchers from various disciplines, attend seminars, and participate in group meetings. These experiences broadened my horizons and gave me a sense of the interdisciplinary nature of research at Caltech. One of the most significant lessons I learned was the importance of collaboration in research. Working with others, sharing ideas, and receiving feedback are all crucial aspects of making progress in any scientific field. I believe this





collaborative approach is something I will carry with me throughout my academic and professional journey.

My time at Caltech also allowed me to think more critically about my future career path. Before joining the SURF program, I was unsure whether I wanted to pursue a career in academia or industry. However, this experience has helped me realize that I have a profound passion for research. The exposure I gained to cutting-edge research in materials science, particularly in the field of applied physics and material science, has deepened my interest in this area, and I am excited to explore it further in the future.

Another important aspect of my SURF experience was the cultural exchange that came with living and working in a new country. The cultural differences between Taiwan and the U.S. were both intriguing and, at times, challenging. Adapting to a new environment, meeting people from different backgrounds, and experiencing the U.S. academic system firsthand all contributed to my personal growth. I am now more confident in my ability to work in an international research setting and communicate with people from diverse cultures.

As my SURF program draws to a close, I find myself reflecting on how much I have gained from this opportunity. It was not just an academic experience, but also a journey of self-discovery. I learned how to navigate a foreign research environment, overcome language and cultural barriers, and develop my skills as a researcher. Although the 10 weeks went by quickly, the lessons I learned will stay with me for a long time, and I am grateful for the opportunity to have been a part of this program.



In conclusion, I would like to express my deepest appreciation to both Caltech and NTU for making this experience possible. The SURF program has been a pivotal moment in my academic journey, and I am excited about the future opportunities it has opened up for me. I am particularly thankful to my mentors, Prof. Harry Atwater and Miles Johnson, for their guidance, patience, and support throughout this experience. Their mentorship has inspired me to continue pursuing research and has made a lasting impact on my academic and professional aspirations.