

Reflections on My Caltech SURF Experience

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Before SURF

I'm an undergrad majoring in Physics and Electrical Engineering at NTU. Before applying to SURF, I have already conducted some research on condense matter experiments. I first heard about this program from friends, and in November I began reaching out to the labs I was interested in. Professor Linda Ye replied and we had a meeting in December, during she expressed her willingness to mentor me and offer the fellowship. Together with her guidance, I completed a research proposal to apply both SURF and BaBar-SURF fellowship. After submitting the required documents - research proposal, transcript and letter of recommendation-in February. I was notified in April that I had been awarded the SURF fellowship in April.

My SURF Research project

My research focused on the synthesis and characterization of magnetic topological semimetals. Topological materials are a new class of condense matter systems classified by their topological order, rather than conventional order parameters. A key property of these materials is the bulk – boundary correspondence, which links the topology of the bulk band structure to protected boundary states. We concentrated on topological semimetals, such as Dirac and Weyl semimetals. Our goal was to explore how coupling topological semimetals with magnetism could break time-reversal symmetry and give rise to novel emergent transport phenomena. I used chemical vapor transport(CVT) and flux growth to synthesize single crystals. I then use X-ray diffraction(XRD) to analyze their crystal structures, energy-dispersive spectroscopy to determine their chemical composition and Laue diffraction to examine the crystal symmetry.

I also participated in the “Quantum SURF” organized by Institute for Quantum Information and Matter(IQIM). Every Thursday, the program included a presentation, a lab tour and a dinner with the hosting faculty. It was a great chance to learn about different topics related to condense matter physics, as well as to see a variety of experiment setups, instruments and techniques. In addition, the program allowed us to build connections with researched in the fields and gain valuable insights and

suggestions for graduate school applications.



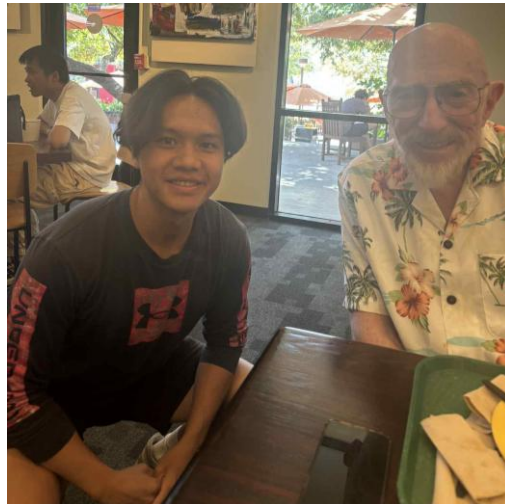
Quantum SURF dinner at Athenaeum



Quantum SURF dinner at CAVA

Beyond Research

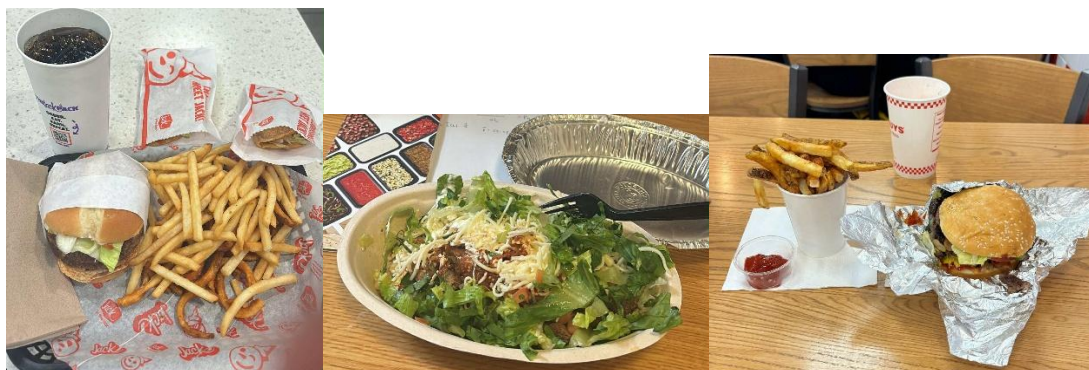
The school has a dining hall and several cafes, where you might just happen to run into some well-known figures — I even had the chance to meet Kip Thorne, the 2017 Nobel Prize winner in physics! There is also Athenaeum, a faculty club where you can enjoy delicious meals and casually chat with faculty member. Beyond the dining hall and cafes, there are a variety of other food choices near the campus. However, the prices are relatively high, ranging from 15 to 20 dollars per meal, so sometimes I would buy ready-to-cook meals at Trader Joe's and prepare food in the housing kitchen instead.



Meet Kip Thorne in the dinning hall



Food in dinning hall



Jack in the box, Chipotle, Five guys

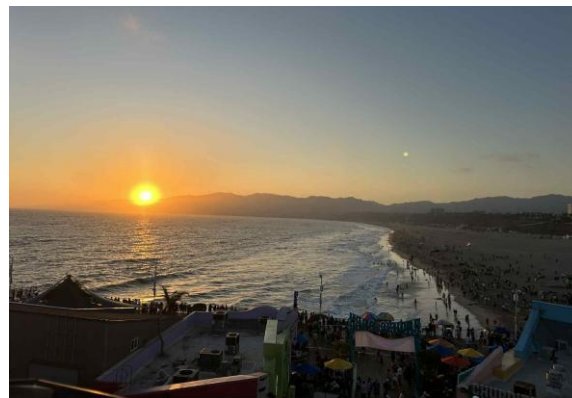
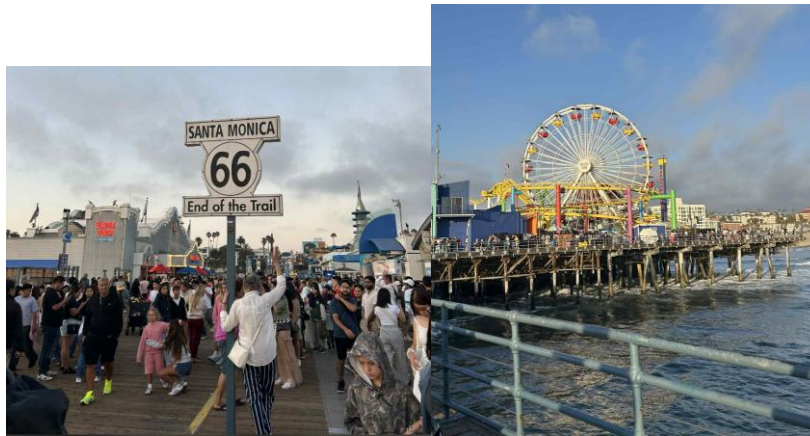


Shake Shake, Urban Plates

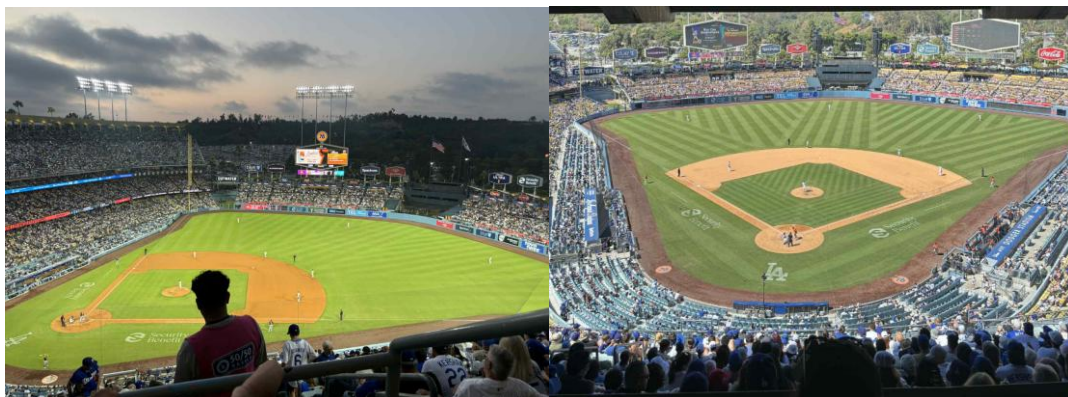


Panda express, In and out, Chick-fil-a

The school also organized many tours around Los Angeles, which made it easy to explore the city at a low cost. I joined trips to Santa Monica, Dodger Stadium, and the Griffith Observatory. Along the way, I made friends from around the world, and we would often go out together to explore more of LA on our own. Other times I simply enjoyed just wandering the city without a set destination, taking in the sights and atmosphere at my own pace.



Santa Monica



Dodgers Stadium

I lived in Fleming, one of the South Houses at Caltech. It's known as the "athletes'

house”, so there was plenty of exercise equipment available inside. I often played basketball or football in the yard, which also turn into a fun way to meet new people and make friends.

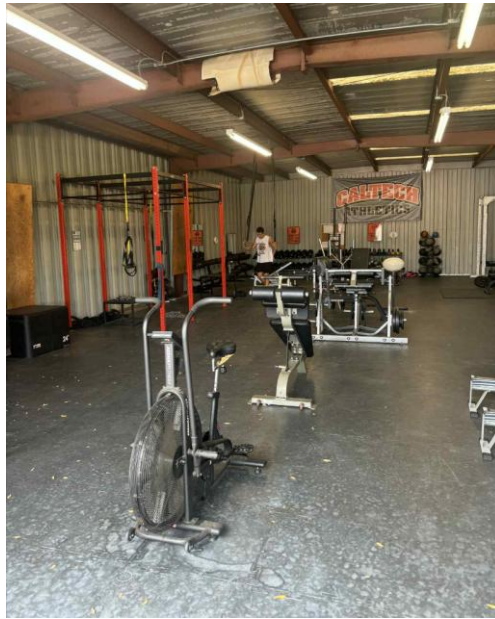


My room and the kitchen



Fleming cannon

There is a gym on campus where I regularly joined pickup basketball games every Monday, Wednesday, and Friday. There were also pickup games for badminton, pickleball and tennis. Not only would they lend you a racket, but they were also happy to teach you how to play if you were new to the sport.



There are three weight rooms in the gym



Basketball court

Acknowledgement

I would like to express my deepest thanks to my mentor, Professor Linda Ye, and my comentor, Tao Lu, for their invaluable guidance and for giving me the opportunity to participate in this research. I am also deeply grateful to James Oyang for the his financial support through the BaBar-SURF fellowship and for his assistance in everyday life during my stay. I would also like to thank to the professor who wrote my letters of recommendation—your support made this opportunity possible. Finally, I am grateful to all the people I met through SURF, their advice and compaionship made this journey not only academically rewarding but also personally unforgettable.

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