

# **Final Reflection on My 2017 Summer Enrichment Program at Stanford University**

**Peter Huh**

This summer, I attended the “Particle Physics” course at Stanford University’s Pre-Collegiate Institutes. For three weeks, our class, taught by Dr. Mattia Di Mauro, delved into the world of elementary particles, dark energy, and theories of the unexplained universe.

## **The Classroom**

On weekdays, I attended a morning lecture, which started at 9:00 a.m. and ran until 11:45 a.m. Each lecture would be loosely based on the book *Introduction to Elementary Particles* by David Griffiths, which we received on the first day. The first week of the program was very mathematically based; Dr. Di Mauro would go over the equations within the book and would explain why each variable was considered or how the equation was derived. He taught us the application of each equation for specific scenarios and encouraged us to explain why the equations were the way they were, rather than simply memorizing them.

Because particle physics is very conceptual, our final two weeks revolved around presentations about the theoretical aspects and history of elementary particles. Each day was filled with interesting, diverse topics, such as the discovery of the Higgs Boson using the Large Hadron Collider, different types of scattering interactions between photons and electrons, and why the movie “Interstellar” might be scientifically accurate in terms of the aging process due to special relativity.

Eventually, we were asked to create our own presentations about different particle physics topics. In fact, I learned almost as much from my peers’ presentations as the lectures!

## **Afternoon Study Sessions**

After lunch, the residential counselors (RCs) would give us a daily assignment. Needless to say, the homework was always challenging; however, working together in study groups and discussing possible ways to approach the problems definitely helped me understand the concepts better than if I had studied on my own. There were people to constantly challenge my thought processes and point out flaws in my approach to the problems. If we were all stumped, the RCs were very helpful in giving us small clues on how to move to the next step, but they never gave us more information than necessary. Through fiery debate and helping one another understand each problem’s solution, we formed friendships based on a shared commonality: the willingness to learn.

## **Residential Life**

There was always a plethora of activities to choose from after finishing homework, so I was never bored outside of the classroom. Playing Quidditch, meditating, playing piano duets with students from other houses, catapulting into random fountains and getting soaked, going on

excursions around campus, and observing ancient Chinese pottery at the Stanford Museum were only some of the numerous activities available to us. One weekend, we waded through the frigid waters of Capitola Beach and visited the San Francisco Museum of Modern Art, where we experienced breathtaking works of art and music. If we tired of the beautiful Stanford campus, we could take the bus to downtown Palo Alto and drink bubble tea to our hearts' content.

Whatever activity we chose, we would always take it to the extreme. Whenever my friends and I would play the piano together, other people would hop in with their instruments, and, by the end, we would be performing as a unified orchestra. Another fond-yet-painful example was an impromptu eating competition using vanilla ice cream (and I later suffered the consequences of participating). Experiences like these wouldn't have been possible without the friends I made at the program; they took an activity that initially seemed bland and turned it into something extraordinary. From them, I've learned to make the best of what I have and to assess a situation to make it better. It wasn't the activities that made me laugh hysterically or smile constantly—it was the people.

While at Stanford, I also took advantage of a unique opportunity to train with the Taekwondo Team. My taekwondo coach had contacted the Stanford team's coach ahead of my arrival and asked if I could train with the team. So, during my free time, I had the opportunity to explore the other side of campus, where the training was held. I got to know the Stanford coaches, professors, and students. Interestingly, the athletes weren't all from Stanford! Because Stanford's taekwondo practices were open to any student, I had the chance to train with athletes from other institutions, such as UC Davis. The only problem related to training with the team was the distance from my dorm to the training venue, which was a two-mile trek. Curfew was at 9:30 p.m., and taekwondo practice ended at about 9:10 p.m., so I always found myself sprinting with a seven-pound bag strapped to my shoulder, trying to make it in time for roll call. However, getting the chance to participate in the inviting taekwondo community at Stanford was truly worth it.

### **Lessons Learned**

Particle physics is hard! I've never had so much difficulty tackling ten problems on a homework set or attempting to even partially understand the complexity of theories. I've learned that even the most accomplished, brilliant scientists sometimes had to rely on inferences and could not solve everything with math. For example, when observing collisions between particles at LHC, particle accelerators sometimes cannot detect all the new particles created after the collision; thus, physicists must draw conclusions and make inferences about what the new particle is.

Aside from my academic growth, I've also dramatically increased my social connections, and I now would have a place to stay in numerous locations across the globe. In addition, I have a host of amazing memories, including Dr. Di Mauro's memes from class presentations, blasting air horns past lights out and almost having privileges taken away, and saying bittersweet farewells to friends. Being surrounded by quirky, academically motivated, talented peers is contagious; as a result, I have a much clearer vision of the goals that I want to achieve and how to go about achieving them.

Of course, I would like to thank the Garwin Family Foundation (GFF) for giving me such a wonderful opportunity. Without the Foundation's encouragement and support, I wouldn't have applied to the program. Thank you, GFF!