

High School Honor Science Program Application

3/9/2014

Part B: Describe the nature and origin of your interests in science and in research.

Theoretical and experimental research is at the core of the scientific advances and the scientific method; they are the tools that further our understanding of the world. I believe that the HSHSP will provide the perfect opportunity to develop my skills and understanding of the world.

In school, the IB programme dictates for students to do labs every month in order to sharpen their data processing skills. Most of these labs are focused on data collection and graphical analysis, but I always go the extra mile and dig deeper into published literature. In writing an extended essay on astrophysics, exploring the connection between distance and luminosity, I read approximately 30 papers and collected over 3000 data points in order to justify my data. Working tirelessly over winter break, I discovered that the true reward of experimentation is when one can connect the trends in their data to a theoretically derived solution. On the theoretical side of scientific research, I recently wrote a mathematics paper on solving the brachistochrone problem using the calculus of variations. Through months of struggling, I taught myself new concepts and then applied them to solve a remarkably tricky problem. Finally, scientific research is a field where scientists are able to combine creativity with the previous knowledge in the field. They are able to develop new hypothesis and pursue them to uncover new truths. For a regional science competition, I led a team to utilize my knowledge of hydrogen fuel cells to develop a concept of a car that runs on ammonia fuel, leading us to win the “Most Innovative” award at Imagine Tomorrow that year.

In my perspective, the most fascinating field of science today is particle physics and nuclear physics. These fields born in the last century are yielding vast results in allowing

scientists to understand the origins the world, such as the Grand Unified Theory, the Standard Model for particle physics, and solutions to the energy crisis. Learning about these at the EPGY “Frontiers of Physics” summer program sparked my interest in this field. There are many unresolved questions, such as the decay patterns of certain fundamental particles, that I would like to explore further. By participating in analysis of particle physics, I would build my knowledge and would lead to my studies in college. Growing up with my dad, a nuclear engineer working to create a Traveling Wave Reactor, I have learned about the energy crisis, and the role of that nuclear power will play. Attending the HSHSP would give me formal learning and hands on experimentation that would allow better understanding of such topics.

If I was selected, I will bring a collaborative attitude and a willingness to learn to the program. My strengths include my solid math and physics background and my compassion to explain ideas to friends and peers. One of the greatest strengths of HSHSP is the ability to collaborate with professors as well as other peers. In my free time, I would try to understand the peers around me and work together to make something exciting happen.

Part C: Describe the impact a book has had on your thinking or any aspect of your life.

*Surely You're Joking, Mr. Feynman*, the nationally best-selling autobiography of esteemed physicist and educator, Richard Feynman, sits prominently on my desk. Since reading it in my freshman year, I have been captivated by the story of perseverance that Feynman readily embodies. It provides me with inspiration for my future and for the future of human understanding.

Richard Feynman is a notable character in science, famous for his work in quantum chromodynamics and the development of the eponymous Feynman Diagrams. His character is as

strong as his research; his life story reveals his personal struggles while working in the Manhattan project. In times of true despair, he was able to turn to mathematical puzzles to occupy his mind, for these conundrums are timeless and elegant. Life has moments of true grief, but the mark of a strong person is the ability to overcome failures and instead keep looking forwards. When crisis approach, I take comfort in that even the best of humanity encounter such inner demons, and that I too will overcome.

Feynman also has a fierce determination to explain his complex ideas to the world. Although he dealt with cutting edge physics topics on a daily basis at CalTech, he thoroughly embraced his teaching duties, avowing that if a topic could not be explained to a freshmen class, then that topic was not fully understood. Nicknamed “The Great Explainer”, he was able to reach thousands of undergraduate students in his Physics 101 course and millions more through the book, “The Feynman Lectures on Physics”. These red tomes sit proudly on my desk, entertaining me when schoolwork becomes too tedious. They also serve as a reminder for what school means to me. In the classroom, I do not passively sit and write down what is on the whiteboard, but jot down questions and rephrase lessons in my own words. I actively seek ways to concisely explain the lesson.

In addition, Feynman taught me the inherent beauty in discovering nature’s secrets. Others may be compelled to research in order to bring a greater good to humanity, but I am a simple person who loves to learn simply to understand. The “Eureka!” moment, when a previously dark room is suddenly lit up like the sun, is something I strive for in my studies and research. That spark of recognition is only found through diligence, not by taking short cuts, which is why I invest my time to learning science.

Feynman has taught me that the geniuses of science are not always those who were naturally gifted, but those who venture into uncharted lands. These innovators must not be afraid to fail, because failure is often inevitable. Their secret is not to be defeated by failure, but to use the lessons learned to develop something better. That motto has moved my life, making me more willing to take a risk to learn something new. I live each day with the purpose of growing my own knowledge of the world, and hoping to make a contribution soon.