

Chunyang Ding

1) What topic in science or math do you currently find most interesting and why? When and how did you become aware of this topic? How have you explored it since?

The calculus of variations has a fascinating backstory, wrought with competition and tension between the greatest minds of the 19th century. Newton, Euler, Bernoulli, and Leibniz all fought over the cycloid and the brachistochrone problem. I first encountered this mathematical puzzle as I explored differential geometry, but the brachistochrone problem soon seized my attention. How did such a simple question – which curve allows for the path of least time? – cause so many disputes and discoveries? I began to investigate the equation $T = \frac{1}{\sqrt{2g}} \cdot \int \frac{\sqrt{1+(y')^2}}{\sqrt{y}} dx$ and discovered that the solution to the brachistochrone problem was a cycloid that could be modeled with $T = \sqrt{\frac{r}{g}} \cdot t$, which was a fascinatingly simple solution to such a complex question. This most fascinating part of this exploration was how it prompted me to research more and more, as each new solution raised more questions. I enjoyed this journey and look forwards to more science and mathematical explorations. (149)

2) We know you lead a busy life, full of activities, many of which are required of you. Tell us about something you choose to do for enjoyment or relaxation.

In this world of free information, I intend to take full advantage of the resources provided. I spend my time swimming, not through the murky waters of Puget Sound, but through the infinitely vast ocean of knowledge online. My favorite pastime is to explore Wikipedia, exploring ideas and whetting my curiosity about the world. The idea that millions have collaborated to collect facts and stories – and make it accessible for the world to learn – regularly amazes me! I love the serendipity of exploring, not knowing where to start, not knowing where to end, but understanding that my travels will stick with me. Of course, Wikipedia is only where the journey begins. Those short, cleanly written articles plant the seeds of ideas in my brain. Wikipedia does not have enough to satisfy my hunger for information, but provides an excellent place to begin. (142)

3) Describe the world you come from; for example, your family, school, community, city, or town. How has that shaped your dreams and aspirations?

I am a first generation immigrant with parents who have taught me the value of hard work above all else. Whatever venture I choose to explore, their requirement is for me to give it my all. No problem is unsolvable, and nothing is too difficult for a person willing to put in the time. This helped me when I leaped into the Gifted High School program at Bellevue, Washington, one of the best high schools in the nation. My origins were humble, but my will was strong: I was determined to let everyone see my diligence. The first year was challenging as I forsook sleep and play to catch up on my studies, but I stuck through all that life could throw at me. My perspective is that life will put mountains in your path, but after struggling to reach the summit, I will appreciate the view all the more. (150)

4) What do you hope to gain from attending SSP?

To merely "know" something is not enough in today's world; one must be able to write, communicate, and develop their ideas in collaboration with others. Therefore, learning in the comfort and safety of one's home needs to be rejected! Attending the SSP would provide me with the perspectives of like-minded peers and challenge my ability to translate abstract ideas into conversation. I look forwards to embracing the struggle - whether through collaborative problem-solving, late night experiments, or reporting on findings. The SSP will place me in the middle of some of the best minds in the world, fostering creativity and realistic thinking like never before. If I qualify, it would be a dream of research coming true. (117)

5) Respond to any or all of these topics with up to 500 words altogether:

Describe a life challenge (of any nature, past or present) you have faced.

Our hearts were all racing in the final seconds of the championship match at the Regional Science Bowl at Portland, Oregon. After ten hours of tough competition, we were just inches away winning. And then we fell.

For scientists, failure is the one thing we all strive against. We put in countless hours, polishing papers and memorizing facts so that we never have to taste that bitter medicine. But for me, what defines a person is not how they handle victories, but how they handle defeats of the worst kind. It takes all of our strength to know how to pick ourselves back again and work even harder for the next challenge.

Describe a time when you could have taken the easy way out, but didn't.

For IB, a major component of our grade is to report on simple experiments, such as the falling time of a coffee filter, the cooling rate of water, or the flow rate of water. However, most of our class understands that the only components required for the grade is to analyze the data properly. Most students just take the easy way out and follow the rubric to the letter. That kind of learning just does not satisfy me. I write reports not for the grade, but to learn more about the topic.

I have been engaged in an organization called Student Voice, which is a national organization that strives for students to take charge of their education. As a team leader for national satellite events, I am passionate about getting students curious about what they learn. The easy way out is never fulfilling, and I do not stand for it.

Describe any science or math reading, research, projects, or competitions (individual or team) you have done outside of regular coursework.

One of my proudest accomplishments in science is the astrophysics extended essay that I wrote five months ago. After conducting over three months of research on stellar properties, I experimented with properties of light and luminescence over distances. It was challenging work to collect and process over hand collected data points, but it was worth it to better understand my hypothesis. However, writing reports and conducting research is not new to me. I began in freshman year with a science project on a new eco-friendly car, a hydrogen fuel cell car powered by breaking down ammonia fuel to hydrogen gas. After reading published papers and going to presentations on the topic, I collaborated with 4 peers to make a presentation at the Imagine Tomorrow Competition, taking home the "Most Innovative" award in our first year of competing.

My accomplishments are not limited to writing papers; I enjoy attending lectures and reading popular science books, but also browsing through published papers on JSTOR or arxiv.org. I utilize the resources around me to the best of my ability, such as asking my dad to explain complex topics to me. Some of my best memories are sitting around the computer, watching my dad present about nuclear engineering and the energy crisis. I've been exposed to the cutting edge of nuclear engineering and have developed new interests to a growing field. (489)

6) Physics/Calculus topics (list)

- Integration
- Complex Number System
- Matrices
- Proof by Induction
- Functions and Equations
- Statistics and Probability
- Vectors and Planes
- Sequences and Series
- Differential Equations
- Advanced Calculus
- Mechanics
- Thermal Physics
- Oscillations and Waves
- Sight and Wave phenomena
- Electric Currents
- Electromagnetic induction
- Fields and Forces
- Motion in Fields
- Energy, power and climate change
- Quantum physics and nuclear physics
- Digital Technology
- Relativity
- Particle Physics

7) No

8) No

9) No