In order to fully understand my passion for physics it is necessary to explain the obstacles overcome so I could pursue this passion, some of those by my parents. Both my mother and father were born into the conservative Protestant sect known as Old Order Mennonites. The Mennonites are known for shunning 'worldly' things, especially education. As a result my mother attended a one-room schoolhouse; her education ended in eighth grade. She quickly grew dissatisfied with the life chosen for her, so she took the GED and applied to college in secret. She was accepted at a state college, but when she told her father of her desire to attend he disowned her, telling her that education turned the heart from God. She attended college anyway, and graduated summa cum laude with a degree in education. When I was born she was committed to making it easier for me to obtain an education than it had been for her, even in the face of financial struggles. For example, in the summers she used our lack of air conditioning as an incentive for spending days at the library. It was on one of these trips in the third grade where an illustration of Schrödinger's cat caught my eye. When I read the juxtaposed simple description of quantum mechanics I quickly decided that I wanted to become a theoretical physicist, beginning my lifelong goal to deeply study high energy theory

Some of my motivation for doggedly pursuing this goal is my indebtedness to my mother. I have been given a great privilege to be able to pursue my passion, as opposed to being a Mennonite dairy farmer, and to not work as hard as I can in pursuit of this passion is an insult to the sacrifices she made. But I also simply love doing physics. Taking a complicated physical concept apart and finding the simplified pictures and symmetries that make it tick gives me joy like few other things. In high school this joy motivated me to campaign to be the first at my small rural school to take online university classes, in physics and mathematics. These classes helped me to be the first person from the district to go to a top tier university in decades. They, together with the Feynman lectures I was reading at that time, also exposed me to ways of doing physics that focused on weaving together pictures, physical intuition, and rigorous mathematics to uncover the heart of physical concepts.

My deep interest in doing physics this way is why I am on track to graduate from the University of Chicago with honors degrees in both physics and mathematics. It also explains why I currently possess a 4.0 GPA in my major, and why most of the classes I am taking this year are graduate level physics courses, e.g. my Quantum Field Theory (QFT) sequence. I appreciate the insight into the inner workings of high energy physics provided by graduate level physics courses, as well as their challenges. My enjoyment of these challenges explains why last year I earned the top score, graduate students included, in my graduate Advanced Mechanics class. I also recognize that often mathematics is what reveals beauty and symmetries in nature, so I have focused a good deal of effort in this area as well. For example, in my second year I took the infamous Honors Analysis sequence, and have taken all other possible honors sequences in mathematics at UChicago. Challenging myself academically like this, and focusing on learning as much as possible, has ensured that I was awarded Phi Beta Kappa in my junior year.

My passion for physics extends outside of the classroom also. In my sophomore year I did not possess the mathematical tools required to study high energy theory, so I decided to pursue nonlinear dynamics, another area of fascination for me. As such, I worked through important fluid dynamics papers with Professor Norman Lebovitz to build up my understanding of nonlinear dynamics. When the summer approached he wanted to restrict the Poisson bracket formulation for inviscid fluid mechanics to Riemann ellipsoids so as to probe their stability. In order to investigate the theory behind this restriction I participated in the National Science Foundation's Research Experience for Undergraduates (NSF REU) in mathematics at UChicago and wrote a paper on Poisson geometry. Writing it revealed to me that using the Poisson bracket made obscure conserved quantities into obvious consequences of geometry. This demonstrated the simple pictures undergirding the ellipsoids' behavior; exactly the type of physics I enjoy. Simultaneously I did original work to numerically analyze whether the Poisson bracket formulation could be used to find Energy-Casimir functions for evaluating stability. It for this work that I received the Goldwater scholarship. In the winter of my junior year my work revealed that the proposed Energy-Casimir functions were not useful for stability analysis, at which point Professor Lebovitz suggested finishing the project, unfortunately partially because of his wife's declining health. Despite this turn of events, I resolved to continue studying fluids due to my interest in the subject, and my lack of experience with the QFT required for high energy theory research. In fact, in the early spring when I heard that Professor Irvine of the James Franck Institute was investigating the similarities between vortex knot dynamics in inviscid fluids and superfluids, I saw a potential to use the intuition I had gained while working with Professor Lebovitz. Thus in the spring of my junior year and in the past summer, I worked with Professor Irvine building a simulation of an airfoil moving in a superfluid. I built the simulation and subsequent analytic tools completely independently, succeeding at a task Professor Irvine had been trying unsuccessfully with undergraduates for several years. I succeeded at this task due to my persistence and enjoyment of the work involved in research.

Although I deeply enjoy my study of physics, I also feel a strong desire to pay forward the enormous impact education has had on my life. Without it I would likely be a Mennonite dairy farmer. In this spirit, I want to help others to see the pictures and symmetries that make physics fun and intuitive. As such, ever since my sophomore year I have been a tutor for the introductory calculus sequence at UChicago. I have made it my mission to engage all of the students, and to ensure they have an enjoyable and challenging experience with mathematics even if they don't end up pursuing it. I also do my best to explain the motivation behind concepts, using all of my experience, whether that means connecting what we are studying to abstract mathematics, or to applications for physics or scientific computing. Most importantly, I make a concerted effort to link my student's work to pictures underlying the concepts they study, so they develop intuition. Teaching in this way is very fulfilling for me, but also provides an excellent way to make sure that I thoroughly understand the topics I am teaching.

I intend to continue my research and study of physics, and aim to prepare myself to teach the subject as well. If I were fortunate enough to receive the Churchill scholarship it would allow me to spend a full year at Cambridge getting a deep background in high energy theory (HET). The scholarship would allow me to take a wide range of the excellent HET courses offered as Part III of the Mathematical Tripos. This would give me a unique opportunity to develop a greater mastery of the material, through focusing only on taking many rigorous courses in HET. I would make sure that I squeezed as much learning out of the experience as possible, bringing to bear the work ethic and persistence that my research and academics reveal. Since I will pursue a Ph.D. in HET, making sure I squeezed as much knowledge out of the Part III experience as possible would allow me to have a firm foundation on which to build my future research. It would also allow me to start researching HET earlier than I might otherwise be able to. Finally, Part III's focus on independence would allow me to focus on making sure that I develop a clear understanding of the pictures lying behind deep concepts in HET. As a future high energy theorist, the Churchill Scholarship would therefore aid my research in the near future and far down the road, as well as the research of my future students by developing my ability to teach HET in the pictorial and intuitive way I enjoy so much.