# Statement of Interest

Dear selection committee,

As I get closer to the end of my undergraduate studies, I feel a growing need for a deeper and more advanced grasp of theoretical physics. My first contact with physics goes back to my second high school year. At that time, I decided I was going to become a theoretical physicist and this decision unleashed my curiosity towards math and physics. While I started to explored all kinds of advanced subjects, from quantum field theory to general relativity, I dreamed of the day they would become the topics of my courses. Until now, my self-study and my undergraduate courses are not enough to reach the knowledge level I seek. The courses and internship you are offering will be a great way to combine and clarify the pieces of understanding I have gathered over the years and go way beyond them. Also, I am part of an undergraduate program that consists of alternating internships with academic semesters. For my fourth and last internship, I can't think of a better choice than the PSI-Start program since I plan on applying to the PSI Master's Program next year.

My research experiences are all related to condensed matter physics. During my first theoretical internship, I had the chance to perfrom numerical simulations of electron-doped cuprates as a first contact with quantum many-body physics in the group of Pr. André-Marie Tremblay. Both the numerical and mathematical methods of this field fascinate me. The mathematical formulation behind the simulations used the notion of quantum partition functions and I could not fully appreciate the meaning of such an object. The quantum statistics and the path integral courses would help me shed a new light on my past research. They would give me a strong basis to better explore subjects that attract me such as quantum information and particle physics. The numerical aspect of the internship was about analysing data produced by the two-particle self-consistent approach. I acquired skills in data representation and learned about the numerical methods of the main algorithm.

In the following internship, I worked with Pr. Ion Garate on a semiclassical model of Weyl semimetals that introduced me to the mysterious chiral anomaly and trained me to solve partial differential equations. This time, I wrote a simulation program myself and became more proficient with Python to solve physics problems. To me, the numerical treatment adds a layer of elegance to every problem it touches especially when Python is involved. I'm interested in the numerical methods course because it is an opportunity to learn about more advanced simulation techniques and apply them concretely to quantum systems. I am very excited about the techniques involved since they add a layer of elegance to spin models.

One of the topics I have self-studied the most is spin. Since my very first exposition to this strange property, I tried to make it feel less strange and more beautiful, as it should be. My desire for elegance in understanding led me to a topological and group theoretic view of spin. I found the subject so interesting and important that I took it as my subject for a popularization project. I am still far from a satisfying understanding of all the details and I would clearly benefit from the symmetry course. More generally, symmetries make quantum mechanics intuitive and I want to become better at using them to solve problems.

To conclude, I think my research experience allows me to appreciate the content of the offered courses and I have a deep desire to make these topics my own to go beyond my current understanding. The opportunity of an internship at Perimeter Institute would help me develop my research skills further and get closer to making my own advances.

I would be honoured to reach my full potential at Perimeter Institute.

Sincerly,