STATEMENT OF INTEREST

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First, I will describe some relevant research experience and future career interests, then I will address my interest in the SMALL program specifically.

My research experience began in Summer of 2017 through the Lewis & Clark computer science department with a project on neural networks. Our team — research mentor Peter Drake, a fellow research student, and I — worked towards an automated process to identify clouds in images of the sky, which could assist climate scientists. We implemented and trained a convolution neural network that takes a picture of the sky as input and distinguishes between clear, thin cloud, and thick cloud pixels with 94% accuracy. This was my first introduction to research and I enjoyed it, but over the next year my interests became less focused on computer science and more focused on pure mathematics.

So, in the Summer of 2018 I moved towards a pure mathematics research project through Lewis & Clark. In this project, my research mentor Liz Stanhope and I considered the abstract geometrical constructions of orbifolds (generalizations of a manifold) and asked: if it is only known at what frequencies an unknown orbifold vibrates at (formally the Laplace spectra), what properties can we deduce about the orbifold? We found such a property, which we call local orientability. We are currently in the process of writing a manuscript on the proof of this result. Before this project, I had never explored one specific area of mathematics so deeply, but I enjoyed exploring the patterns that arise from the question and to contribute a tiny additional piece of understanding to mathematics.

As a side note, while I have not taken a course in abstract algebra, orbifolds are defined by having local structure of the topological quotient of $\mathbb{R}^n$ with respect to some group of isometries. So, in working with an classifying orbifolds, I had to learn some basic abstract algebra.

The orbifold research project has influenced my future career interests. In particular, I am now highly interested in mathematics research and teaching which I now discuss.

Firstly, the orbifold research project has motivated a potential future in research. I would like to continue learning mathematics, so I plan to pursue mathematics to the Ph.D level and continue research. In particular, I have an interest in differential geometry. I am currently doing an informal independent study with professor Iva Stavrov on Riemannian geometry and relativity. I find both this study of Riemannian geometry and the research project on orbifolds to have an appealing connection between mathematic formality and visual intuition, which in part contributes to my interest in differential geometry.

Additionally, after participating in this study on orbifolds, I now would like to pursue a career in teaching. Unexpectedly, I particularly enjoyed presenting my research project

through various slideshow or poster presentations. Specifically, I gave a slideshow presentation to the other research students on campus — primarily biology and chemistry students — in which I described the project. I attempted to give an intuitive interpretation of the research question and our approach to answer the question while maintaining accuracy. And, I believe that the audience left with an intuitive understanding of my project and hopefully an appreciation for the natural patterns that are captured behind the formality of math. This sharing of intuition is something that I try to do in my work as a math, physics, and computer science tutor at the Lewis & Clark tutoring center, and it is something that I would like to continue in the future with teaching.

Now, to address the SMALL program, the Dynamics and Number Theory project particularly appeals to me. If I understand the project correctly, the question itself is fairly simple: can we break down numbers into a form in which periodicity is equivalent to being in some specific class of algebraic numbers. But, as stated in the description, it appears answering this question in part makes use of many different aspects of mathematics; I noticed that many of these aspects involve topology and manifold theory. As discussed above, I am interested in differential geometry and I am intrigued on this apparent connection between a more classical number theory question and the theories of topology and geometry or other areas of mathematics.

Additionally, I would find having a research experience outside of Lewis & Clark College valuable. The three mathematics professors I know best at Lewis & Clark and those that would have research opportunities in pure mathematics all specialize in differential geometry. While I enjoy differential geometry, I would like to utilize my time as an undergraduate exploring more parts of mathematics — perhaps I will find a subject even more interesting to me that I will pursue. In addition to the mathematics itself, I would value the experience conducting research in a different environment which will broaden my understanding of the research process.

Finally, I would like to experience living on the east coast — someplace I have never been. It appears that Williamstown is close to various forests, trails, and nature in general. As a Pacific Northwesterner, this something I appreciate. I run nearly every day, and it would be nice to have new trails to run, new places to see, and new mathematical puzzles to explore.