I am interested in theoretical and computational nuclear physics, and in the implications of quantum fluid dynamics in nuclear interactions. particularly in the dynamics of quantum fluids and their implications in our understanding of nuclear interactions. A diverse research background, including projects in theoretical and experimental physics and engineering, has made me informed and confident in my choice to pursue a research career in this discipline.

I dabbled in several degree programs as a first-year student at the University of Colorado, but the urge to dig below the topical explanations of first-year courses ~~and understand why~~ led me to a tiny honors section of freshman electricity and magnetism. ~~in which~~ Here we were challenged to push our curiosity and use reason to solve problems ourselves that we had never seen before. (TRY TO PUT THESE PREVIOUS 2 SENTENCES INTO ONE, BUT DON’T MAKE IT THE WORLD’S LONGEST SENTENCE) ~~The course resonated with my persistent love of problem-solving and piqued my interest in research.~~ From there, two summers in optical remote sensing, the first in system design and the second developing computer algorithms for image analysis, and an academic year in experimental liquid crystal materials research, sealed my desire to pursue a career in research. ~~The central role of topology and abstract algebras in describing the dynamics of structure in the liquid crystal medium sparked my fascination with pure mathematics, and alongside a side project developing simulations of liquid crystal dynamics convinced me that theoretical physics was my place. I thoroughly enjoy the everyday programming and algorithm development opportunities in theoretical physics.~~ (MOVE THESE X-ED OUT IDEAS TO TALK ABOUT PAUL AND DANA)

Combine these two paragraphs but keep the size reasonable.I began working with Asst. Professor Paul Romatschke’s Nuclear Theory group at the University of Colorado in the spring of my sophomore year, motivated by interests in (MATHEMATICS I HAD SEEN BEFORE WITH IVAN AND…) theoretical physics and fluid dynamics and curiosity about high-energy physics. I have been writing simulations based on lattice kinetic theory of the Fermi gas at unitarity and using them to study shear viscosity and elliptic flow in cold quantum gases. This project is characteristic of an approach to physics that most appeals to me: Eek! A colon!!! to study how the most elementary of a system’s interactions reveal complex macroscopic physics. To place these interests in broader context, I took a graduate course in plasma physics ~~from the graduate program~~ at the University of Colorado and spent 8 weeks with Professor Dana Longcope at Montana State University simulating shocks in solar flares and studying energy release in magnetic reconnection events. WHAT INTERESTS ME ABOUT THIS STUFF?? *(Describe why you like his discipline, and particularly make clear what makes it appeal to you more than plasma physics. Describe how your experiences in plasma physics help support your current and future research in nuclear theory)*

I am attracted to the large and active community of nuclear theorists at the University of Washington and the Institute for Nuclear Theory. I would be particularly interested in a project with Dr. Aurel Bulgac studying the shear viscosity or superfluid transition in the unitary Fermi gas, topics in which I have become interested through my undergraduate research, or in studying vorticity

WHY DO I WANT TO STUDY NUCLEAR THEORY?

* I like the fundamental (purist) theoretical approach
* I am excited by how we can study the macroscopic behavior of (e.g.) QGP using a relative of age-old physics (fluid dynamics) and back out the microscopic nuclear interactions (e.g. between quarks and gluons)
* What can we find out from understanding the strong interaction? Everything is made of nuclei obviously. Why no free quarks?

Each of my research experiences has reinforced my desire to become a professor and researcher in order to continue my investigations in physics and share mentorship relationships with passionate students and future scientists.

A diverse set of research experiences early in college convinced me that I wanted to pursue a career in research. A set of summer projects with Professor Joseph Shaw and the Optical Remote Sensing group at Montana State University, first in system design and second in image analysis algorithm development, exposed me to several important engineering problems that impede progress in the experimental sciences and introduced me to the role of computers in making data analysis possible. Through an academic-year research apprenticeship with Asst. Professor Ivan Smalyukh and the Liquid Crystal Materials Research Center at the University of Colorado, I became involved in a side project writing simulations of liquid crystal dynamics and became interested in computational physics and theoretical fluid dynamics. The central role of topology and abstract algebras in describing the dynamics of structures in the liquid crystal medium sparked my fascination with pure mathematics, which I have pursued in parallel with my physics curriculum ever since. These experiences convinced me that I wanted to pursue a career in research because I am motivated by understanding why something happens and do my best work and am happiest when faced with a good challenge, and I sought a more theoretical research domain.

YOU DON’T WANT A LAUNDRY LIST OF YOUR PAST RESEARCH, JUST AN EXPLANATION OF HOW IT LED YOU TO YOUR CURRENT STATE.

What did these experiences do for me?

**Engineering projects with Joe**: experience in design and exposure to engineering challenges, lots of experience programming

**Experimental soft condensed matter with Ivan**: became interested in topology, abstract algebras. Became interested in computational physics and fluid dynamics

These experiences convinced me that I wanted to do research, but they also left me wanting to understand the theory at the basis of the disciplines.

Then I started working with Paul, and it was great. Describe why you like his discipline, and particularly make clear what makes it appeal to you more than plasma physics. Describe how your experiences in plasma physics help support your current and future research in nuclear theory.