Rapid advances in modern computing are enabling physicists to tackle previously unanswerable questions about our universe in entirely new ways—the advent of the digital age has made our times among one of the most exciting for scientists in the history of humanity. Last year I wrote a physics simulator almost entirely from scratch that reproduced the Apollo 8 mission—something that once took the combined might of warehouse sized computers—a culminating experience in a class that left me for the first time feeling like I was capable of joining modern computational explorers in uncovering some small mystery of the final frontier. I’ve always known that I wanted to go to graduate school—my overarching goal in life is the pursuit of knowledge for knowledge’s sake—but this was the first time I realized my skills could potentially contribute to that knowledge base.

I’ve had the best undergraduate experience any student could hope for—my department is small, enabling me to foster great relationships with my professors in both my academic and research pursuits. I’ve been able to maintain a 4.0 in my physics coursework largely because of the above and beyond support in time and patience my professors have been willing to spend with me in my quest to internalize even the tiniest bit of how the universe works. One of the closest relationships I’ve built is with my research advisor, Prof. Daryl Macomb, whose projects I’ve enthusiastically been a part of since the spring of this year. Prof. Macomb’s research interests align well with mine—he’s interested in some of the strangest and highest energy objects in the universe, pulsars, and he utilizes intensive data analysis to study them. The project we’ve been working on since spring and through summer is identifying accreting x-ray binaries from archival CHANDRA and XMM Newton data. We’ve cross-referenced likely x-ray pulsar sources in the Small Magellanic Cloud for changes in period (using Fourier analysis) over many years that could be caused by accretion processes. The trickiest problem for us has been trying to eek out detections from lower power sources that have thus far gone unnoticed, and my largest individual contribution to the code base thus far has been developing an algorithm that allows us to test the statistical significance of finding lower-power pairs from a large background observation map I created and thus strengthen our detection confidence. In working intimately with Prof. Macomb on this project I’ve learned Linux (I now dual-boot with Mint), the command line and shell-scripting, been exposed to new languages like Perl and Fortran, learned to write advanced programs in my new favorite language, Julia, and learned to process and reduce immense datasets with the help of tools like HEASOFT and SAS. We are in the process of writing a paper on our results that we hope will be submitted by early spring (need to check with Daryl that this is actually true).

When I’m not doing research I spend a large portion of my time teaching—another benefit of our smaller department is that I have been able to teach undergraduate physics and astronomy labs for the past two years as well as cohosting our department’s drop-in tutoring lab. I’ve also enjoyed my role working as a cosmic communicator on weekend nights to visitors at the largest public observatory in the state, where I give talks and get to show off the wonders of the universe through a plethora of large telescopes. It’s important for me to be able to teach what I’ve learned in my classes and communicate technical knowledge in a succinct and accessible way, skills that I’ve developed in large part due to the wealth of teaching and outreach opportunities I’ve had in Boise. I’m passionate about ensuring education is accessible and equitable to everyone regardless of demographic, and I’ve put these skills to work in my latest outreach project—teaching physics and programming in some of our local prisons.

Given the broad applications of computational science to astrophysics I could fit well into nearly any project at Berkeley, but the two groups that especially interest me are Prof. Kasen’s and Prof. Parson’s. I have enjoyed the research I’ve conducted thus far not just because of the computational challenge it’s presented, but also largely due to the subject matter—high energy objects like pulsars are fascinating and awesome oddities of our universe, but so are highly energetic transient events like supernovae and neutron star mergers. I’m thus incredibly interested in Prof. Kasen’s computational astrophysics research on these topics, both from a theoretical and observational perspective. I have had a wealth of valuable experience in manipulating and processing data as a result of the observational aspects of my research experience thus far, and I would be delighted to be able to apply those skills to tackle a fundamental cosmological question with HYPERION, helping Prof. Parsons search for the monopole reionization signal of neutral hydrogen from one of the earliest epochs of our universe. To be able to do research tackling such important and exciting curiosities about our universe is certainly a large part of what makes Berkeley excellent, but the way the department and the university foster diversity and inclusion within that academic excellence seems at least equally as important to Berkeley’s stellar reputation. The opportunity to collaborate with such a diverse and supportive community is rarer than it should be in academia, and there seems to me no better place to do research with that mindset than Berkeley, and that’s ultimately what makes it my top choice in continuing my academic journey. I hope to use the knowledge and skills I gain in graduate school to advance not only to satiate my cosmic curiosities, but to uplift and inspire others to follow suit—especially those whose privilege hasn’t been as great as mine. I hope to continue in academia as long as possible to advance a better culture of possibility for all, and there’s no better place to be trained to do this than at Berkeley. To that end, I hope you will consider me for admission into your astrophysics program, that together we might uncover some small mystery of our universe while simultaneously making it a better place for all along the way.