

Proposed Research Essay

Undergraduate experience has led me to an interest in observational cosmology and large-scale structure, topics I will pursue in graduate study. Though I have not yet completed my undergraduate degree, I have laid the foundation for work I will begin next year. Personally, I am interested in outreach programs dedicated to attracting young women and minorities to science. I'm also looking forward to teaching opportunities, especially for non-majors. The chance to address such issues in my graduate and professional career is a major part of my interest in advanced study.

My summer research position advisors attracted me to extragalactic astronomy and major cosmological principles. I then started my current research, a senior thesis for my school's Advanced Honors Program, comparing cosmological models to current cosmic microwave background data. Computing likelihoods will determine a best-fit model and place constraints on cosmological parameters. I enjoy my thesis, because I get to work with currently relevant data. Comparing the data to theoretical predictions, I gain a more clear understanding of the theory. In graduate school I will for the first time play a part in observations and data reduction. My undergraduate work prepared me for this future, as I learned a great deal about working with data and using computational and statistical methods to interpret it.

I plan to study observational cosmology. Our view of the universe is limited: if an object is far away, we see it as it was long ago. To get an idea of what the object looks like now, we must compare it to closer objects. This obscures the issue of observing the universe. My senior thesis provides one approach to this question: computationally, how would we expect the universe to act under a given set of parameters? Studying galaxies is another approach. Galaxies provide clues to the early universe, and we theorize how the structures seen today could have been produced by a primordial mass distribution. I'm particularly interested in using extragalactic observations to probe cosmology. The role of dark matter is incredibly important in both galactic dynamics and cosmology. Observing galactic starlight and dynamics can determine the dark matter content; this compares to the cosmic microwave background power spectrum, the features of which are determined both by baryonic and dark matter. Such analysis is powerful; agreement between two different measurements strengthens our confidence in each.

Since I am still an undergraduate, my future in research and graduate education is yet to be determined. Wherever I end up, however, I'm glad that I accepted opportunities for summer research and the chance to be a part of the A University Advanced Honors program. I have been lucky to attend an institution that stresses research on the undergraduate level. As a double major in B and C, I have attained an interesting and diverse education, and am ready for the challenges ahead.