I plan to pursue a doctoral degree in astronomy with the eventual goal of doing original research on galaxies at a national institute or observatory. My father, an immigrant and first-generation college student who is now a university professor, likes to say that the key to success in research is simple. "Never worry about what other people think," he says. "Do good science, and the rest will follow." As a future astronomer, I aim to "do good science"—both by broadening my own knowledge through research, and by encouraging the next generation of scientists through mentoring and outreach.

Although I am now sure that I want to study galaxy evolution and formation, my undergraduate research career has spanned a **wide variety of research topics**. My first research experience was through a computational astrophysics REU as a freshman at North Carolina State University, where I worked with department head Dr. John Blondin on supercomputer simulations of core-collapse supernovas. Although the process by which supernovas occur is fairly well-understood—supermassive stars run out of fuel and collapse in on themselves before rebounding in a massive explosion—the exact details of the explosion mechanism are still uncertain. I studied the turbulence that is thought to power these explosions by running multidimensional simulations on the Kraken supercomputer, then writing programs to extract and analyze data from the simulations. Through this project, I learned how to program, a skill that has since proved invaluable. Furthermore, as I continued to work throughout my freshman year, I met and compared my results with Dr. Eric Lentz from the computational astrophysics group at Oak Ridge National Laboratory; here, I was able to learn firsthand how scientists collaborate and discuss ideas.

I then spent a semester internship working with Dr. Patrick Treuthardt at the North Carolina Museum of Natural Sciences. Here, I aimed to understand the kinematics of galactic bars by measuring the curvature of the dust lanes within the bars. Unlike in my first internship, where professors offered specific projects and taught mini-seminars on each project to catch the students up on the current state of research in each field, I had to learn everything myself by reviewing the scientific literature. To better quantify the shape of the dust bars, I applied my programming skills by writing algorithms to enhance images of local barred-spiral galaxies.

The next summer, I was accepted to an REU at the Space Telescope Science Institute in Baltimore, Maryland, where I worked to analyze galactic emission line data from the NewHα narrowband imaging survey. This was the project that first interested me in **galaxy formation and evolution**, which has since become my passion. During the REU, I estimated galaxy properties from data that had been processed by a previous student. I then plotted these properties of a sample of galaxies to determine if the "fundamental metallicity relationship" between galaxy stellar mass, metallicity, and star formation rate (SFR) is really "fundamental" over cosmic time. I quickly found that I loved the critical thinking that went into understanding the physical story behind the observational data, like considering all the parts of a puzzle and piecing it together.

With help from my advisers, Dr. Janice Lee and Dr. Chun Ly, I continued to work on the paper throughout the next two years. The results were inconclusive, but I was able to put constraints on the parameters of the mass-metallicity-SFR relation and suggest specific courses of action for future studies. I submitted, revised, and published our results as first author, I and presented my results in a talk at the 2013 American Astronomical Society meeting in Washington, D.C. I was later invited to participate in a follow-up observing run with Dr. Ly. We used the Keck Telescope in Hawai'i to obtain spectroscopic data for more galaxies to improve upon the sample size of my original analysis. I realized that this kind of observational extragalactic research, inferring evolutionary trends from snapshots of the universe, was what I wanted to pursue (see Research Statement).

Although I knew I loved studying galaxies, I still thought it was important to broaden my horizons, so I also chose to work on some non-astronomy-related projects. I spent a year in Dr. Karen Daniels' soft matter lab at NC State University building and running an experimental apparatus to measure the dynamics of folded polymer sheets. I applied a varying force to chains of folds and measured the changes in deformation. This was a joint project with the NC State nuclear physics group, who wanted to use a folded polymer tube in an ultracold apparatus to measure the neutron electric dipole moment, so I was also able to work with graduate students to help set up parts of the cryogenic apparatus. Here, I discovered what it was like to work in a lab group environment, and I had some useful experimental techniques—like basic machining, keeping a detailed lab notebook, and laser safety techniques—drilled into my head.

I also spent the next two summers at the European Centre for Nuclear Research (CERN) in Geneva, Switzerland, working on trigger software for the NA62 experiment. The NA62 experiment aims to find a hole in the Standard Model of physics by studying a particular decay of the kaon particle which occurs only once every 10^{12} decays. To find these ultra-rare decays, the detectors need an extremely efficient system of so-called trigger software to reject background decay modes. Advised by Dr. Philip Rubin of George Mason University, I developed multiplicity trigger algorithms to count the number of rings in a Cherenkov detector produced by charged particles. I reported the results of my work in two written technical notes, as well as in a presentation at a weekly collaboration meeting. Parts of my algorithm are now being used in the partial data run of the experiment, and they may be used in the full data run as well. I also worked on hardware cabling for a detector readout system to help prepare for the partial data run, and I attended the summer student lectures on a variety of particle physics topics.

I am now working with Dr. Jim Kneller at NC State University to build off my first research project on supernova turbulence. This turbulence has been shown to affect how neutrinos produced in a supernova oscillate between different flavors. I am once again using my programming skills, this time to modify simulations of neutrino oscillations through supernova density profiles. Previous students have examined the effects of random-field turbulence on three generations of neutrinos. I plan to include radially-dependent turbulence and four generations of neutrinos. I am currently using supernova simulations, like the ones I ran in my first year, to find a functional form for the radial dependence of turbulence.

Throughout my various research projects, I have been very fortunate to have mentors to help guide and encourage me. I am certain I would not have made it this far without these mentors, and so I believe it is my responsibility to pay it forward by **inspiring and mentoring the next generation of scientists**. My internship at the museum began pushing me in this direction early in my undergraduate career, since I worked in the museums Nature Research Center, where researchers work behind glass windows so museum visitors can see what science really looks like. As I heard comments from visitors—including one little girl who excitedly pointed at me and told her parents, "Look, she's a girl and shes doing science on the computers, so I can do it too!"—I realized that I wanted to continue being a role model for future scientists.

To that end, I volunteer every year for the North Carolina Science Olympiad. Participating in Science Olympiad competitions in middle and high school encouraged my love of science and helped me discover different fields in science; in fact, I took my first astrophysics course in high school in order to prepare for the Astronomy event. Now, I volunteer as a test writer and event leader for the state tournament. Last year, I was also an assistant coach for a Science Olympiad team from an all-girls' school that had never before competed. Although not all of the girls were able to place in the regional tournament, some did—two girls even won first place in the Simple Machines event, using the lever I had coached them through building. Many of the girls are now in high school and are continuing to pursue science elective classes.

However, volunteering just once a year for a tournament is not enough, so my friends and I also worked with local high school students to start a group called Serious About Math and Science (SAMS) Club. The goal of SAMS Club is to get high schoolers interested in science by having college students teach monthly workshops about STEM topics. We emphasize topics that are not usually covered in the high school curriculum, and we try to use hands-on demos; for instance, some of our most popular workshops have included learning about thermodynamics by experimenting with liquid nitrogen, and testing basic search algorithms with giant mazes taped to the floor.

Finally, I have tried to encourage the next generation of scientists in my own university, where I am one of only two women of color among the physics majors of my year. Although I have never faced blatant discrimination, I have occasionally felt alienated and dismissed by many of my peers. As a result, I am now doing my best to ensure that younger women in the physics department never have to feel the same way. I am active in the Women in Physics group at NC State University. This year, I am organizing the school delegation to the regional Conference for Undergraduate Women in Physics sponsored by the American Physical Society. I have often had meals with incoming and first-year physics major women, to encourage them in their studies and give them advice about research and classes.

"Doing good science," to me, is a twofold goal: to do quality research and communicate it to the public, and to foster future scientists of all backgrounds. Graduate school will help me pursue these objectives by not only preparing me for research as a professional astronomer, but also by helping me develop the interpersonal skills needed in mentorship and teaching. As I begin my graduate studies and beyond, I plan to continue to do the best science I can.