Fighting numb fingers and wind-whipped cheeks, my professor and I hammered stakes into the snow and set up GPS devices. For hours we traveled amongst crevasses on Taku Glacier in Juneau, Alaska, obtaining high precision surface velocity measurements on the glacier in order to calculate strain rates. The research was exhausting, but I was hooked.

My fascination with glaciers and the Arctic was a natural culmination of years of interest in science and a love for cold and snow. My parents fostered within me an appreciation for the outdoors and a desire for knowledge, and from a young age, I harbored a genuine scientific curiosity. Growing up in Maine, I spent hours hiking and cross-country skiing, and I loved the pristine white cold of winter. After my father died in a mountaineering accident soon after my 11th birthday, my scientific focus and affinity for wilderness and winter became ways to remain connected to him. For years, I pursued what I thought of as separate interests in physics, math, skiing and snow. It never occurred to me that someday I might combine these passions.

At the end of high school, I received the Morehead-Cain Scholarship at the University of North Carolina, a full merit scholarship that included four funded summer experiences. This incredible opportunity led to my decision to leave New England and head south to attend university. During my first semester at UNC, I enrolled in a geology honors first-year seminar in which we conducted field research in the Sierra Nevada. As I scrambled over glacial moraines each day and prepared the initial results from our moraine surveys at night, I discovered a passion for geoscience and research. This course unlocked a subject that combined several of my interests, and I realized that I wanted research to be an integral component of my undergraduate years. The following semester I declared a major in geophysics and continued my research on glacial moraines, learning basic programming skills in order to incorporate modeling hillslope diffusion into my work. I ultimately presented this research at the Geological Society of America Cordilleran Section Conference in Queretaro, Mexico. During my sophomore year, I worked in the UNC Wave Propagation Laboratory studying polar synchronization using sediment core proxy data. My primary responsibilities included organizing hundreds of paleoclimate records and writing code to convert raw data into the format needed for analysis. Though I enjoyed working in the lab, the experience showed me that instead of studying the past, I prefer researching current Arctic processes and in particular, how glaciers are responding to climate change.

The summer after my sophomore year, I had the opportunity to participate in the Juneau Icefield Research Program (JIRP). While traversing the icefield, I was exposed to numerous glaciological research methods and began to identify my own research interests. I dug mass balance pits, completed GPS surveys and learned about safe glacier travel while spending each night listening to lectures detailing the various fields of glaciology. The powerful combination of hands-on field research and formal scientific education made the summer one of the most formative experiences of my life. Through working with so many polar science students and early career researchers, my summer on JIRP solidified my desire to pursue Arctic research and study glaciology.

As we traveled around the Juneau Icefield, I became mesmerized by the sheer scale of the ice surrounding me and by the complexity of the numerous factors governing ice flow. Despite warming temperatures and decreasing snowfall, Taku Glacier, the largest glacier on the icefield, is advancing, and this seemingly inconsistent fact fascinated me. For my personal research project, I investigated strain rates in shear zones on Taku Glacier, comparing GPS-derived data to satellite measurements. Back at university, I analyzed the surface velocities to calculate strain rates and compared my data with inSAR-derived velocities and strain rates. After completing the

initial investigation, I was invited to work with several professors in Alaska and Canada on building a bed topography model of Taku Glacier. Employing a method previously applied to Columbia Glacier, we are using satellite velocity data and mass balance models to calculate the mass flux through the glacier. By running the model in reverse along parallel flow lines, starting at the terminus where the bed topography is known and progressing upglacier, we can use the mass flux along each flow line to determine ice thickness and thus the bed topography of the entire glacier.

Through my undergraduate courses and research, I have discovered a personal preference for programming and modeling. Modeling plays an extremely important role in determining glaciers' contribution to sea level rise and the corresponding global impacts. Though I enjoy fieldwork, I find this analysis that occurs in the laboratory most satisfying. I started learning to code during my freshman year, and since then I have taken every opportunity to develop my programming skills. For my senior thesis, I chose to build an algorithm that quantifies the timing of river ice breakup using MODIS data and then use this method to investigate breakup timing across the Arctic region. I am currently constructing a program that employs a series of tests to classify each pixel as fresh snow, old snow, river ice, water or cloud over the two-month breakup season. The output of this code will allow me to examine trends in surface change across my hundreds of classified images. Despite the occasional setbacks and moments of frustration, my passion for polar research largely derives from these hours at the computer, whether building a bed topography model or analyzing satellite imagery. I find myself endlessly chasing the hundreds of moments of miniature satisfaction: those instants when the code runs and my hard-earned results demonstrate an interesting conclusion.

Broader Impacts:

My experiences in research have not only determined my career plans but also changed how I think about education. Asking difficult questions, dealing with uncertainty and learning how to be creative in the scientific process have all been important skills I have gained from research. My undergraduate research has given me the opportunity to apply what I learn in my courses to real world problems and ultimately has defined my college experience.

Throughout my time at UNC, I have endeavored to share this love for research with others. As a member of Order of the Bell Tower, UNC's official student ambassador organization, and as an admissions tour guide, I have devoted a significant amount of time to taking about academic opportunities at UNC. I also am an Undergraduate Research Ambassador and routinely give presentations to students, parents and professors about engaging undergraduates in research. Additionally, I have twice served as a teaching assistant for the same field geology first year seminar that introduced me to research. In this extremely rewarding role, I have developed my own teaching skills and helped other students conduct their first research projects in the Sierra Nevada.

I also believe strongly in the importance of recognizing human implications of research and communicating information about polar science to the general public. Though my interest in polar regions stems largely from a scientific perspective, I am fascinated by the inseparability of ice and life in the Arctic. To broaden my knowledge about the Arctic, I spent the fall semester of my junior year studying polar science in Copenhagen, visiting Kangerlussuaq, Greenland as part of my coursework, and interned with an Arctic tourism company in Iceland the following summer. Meeting local Greenlanders, experiencing Greenlandic culture, visiting the Greenland Ice Sheet itself and seeing firsthand what life is like in a tiny remote town in the Arctic helped me contextualize my Arctic research pursuits and marked the beginning of a fascination with

Greenland. Living and working in Iceland and traveling all over the country taught me about the socioeconomic impacts of Arctic warming and challenged me to think about how I might combine my scientific pursuits with broader questions about the future of life in the Arctic. These experiences have shown me that science and human interests in the Arctic are intertwined, and I plan to always incorporate human impacts into my research.

I intend to pursue a PhD in polar science, specifically focusing on studying outlet glaciers on West Greenland. I plan to attend a graduate school with a demonstrated emphasis on polar study and a strong commitment to multidisciplinary polar research. My primary career goal is to become a professor at a research university, but I also hope to spend a few years working as a postdoctoral researcher or working for a national scientific organization like NASA. I love both research and teaching and can think of no better career than conducting glaciological research while also teaching undergraduates and mentoring graduate students. I have benefited tremendously from working with graduate students and professors during my time at UNC, and I will definitely incorporate mentoring undergraduates into both my graduate study and my professional career. I especially would like to increase the role of women in polar research, for even though polar science is growing as a discipline, the field remains overwhelmingly male. In entering this field, I hope to serve as a role model for young women interested in glaciology and earth science. My leadership training through the Morehead-Cain Scholars Program, North Carolina Fellows Program and National Outdoor Leadership School has given me the skills and confidence to progress in my field and succeed as a female scientist.

Sea level rise and climate change are undeniable realities, the consequences of which we are just beginning to face. Understanding the processes controlling the melt and retreat of Greenland glaciers is vital to improving the accuracy of sea level rise models, and the results of this research will likely have major implications for policy and industry worldwide. The challenge is communicating this information to a greater audience in ways that are understandable and also inspire action. Raising awareness about polar change through both a blog detailing my personal and academic experiences in polar science and presentations at my university has been a significant component of my journey thus far. Communicating the value of research on polar change and the relevance of its findings will be of utmost importance in my career.

In the Arctic, time moves differently. Days and nights become meaningless, sunsets can last for hours and magnificent colorful lights curling through the sky invigorate cold darkness. Glaciers carve out harsh yet beautiful landscapes while preserving the history of Earth's climate. The Arctic is fragile yet amazingly resilient, a prehistoric environment perilously existing just at the edge of human impact. The more I have studied and visited the far north, the more my desire to understand and protect the Arctic region has grown. I feel very fortunate to have found a life calling that combines my scientific interests with a subject that never ceases to amaze me. Receiving the NSF Graduate Research Fellowship would give me the flexibility and resources to pursue this fascinating research as I begin what I hope will be a lifelong career in polar science.