

Example Personal/Goals Statements

Montana Space Grant Consortium:

3.0 My interests in Astrobiology and the physicochemical factors that impact habitability began nearly ten years ago, and have led me to study at the extremes of temperature (from hot springs in the western U.S. to lakes in the Antarctic), and in the oligotrophic Pacific Ocean, where low concentrations of required nutrients make it one of the most dilute environments on Earth. I am currently a doctoral candidate at MSU, working with Dr. John Priscu on my dissertation on the linkages between and limitations on biogeochemical processes in low-energy environments.

During the austral summer of 2012-2013, I was part of the WISSARD project that accessed Subglacial Lake Whillans (SLW), which lies 800m beneath the surface of the West Antarctic Ice Sheet, and made the first measurements of microbial activity and elemental cycling in a subglacial lake. My dissertation focuses on life in SLW and its associated drainage system. In an effort to better understand the limitations on life in what I hypothesized would be a highly energy-limited environment, I carried out a series of experiments aimed at understanding the impacts of temperature and nutrient limitation on life in SLW. My current work is a continuation of this project.

Before working on SLW, I carried out research in the McMurdo Dry Valleys of Antarctica (2008-2010), focusing on microbial life in the surface lakes of the region, and completed my M.S. in 2010 with support from a MSGC Fellowship. My Master's project concentrated on the responses of bacteria in the Dry Valley lakes to the onset of winter darkness, a time when no freshly produced organic carbon is available to sustain life. I published two papers from this work, both with support from MSGC. My work on hot springs in the Great Basin of the western U.S. (2006-2008) focused on understanding microbial life and metabolism at high temperatures, above the known limit for photosynthesis, work that I published in *Geobiology*.

I was recently awarded a NASA Astrobiology Institute scholarship to attend the 2014 International Summer School in Astrobiology, which will take place in June 2014 in Santander, Spain, and was invited to serve as Science Advisor for the Montana Space Public Outreach Team 2013-2014 show, "Life in the Universe". The Association of Polar Early Career Scientists elected me to serve as Early Career Representative to the International Scientific Organizing Committee for the 2014 Scientific Committee on Antarctic Research Open Science Conference, the largest international conference showcasing Antarctic research. I maintain a strong commitment to public education and outreach, and during 2013 was invited to give lectures on Antarctic microbial ecology and subglacial environments at the Colorado Springs Science Festival and the University of Georgia's study abroad in Antarctica program.

The NASA GSRP program is currently only open to renewal applicants, and my research does not satisfy the remote sensing focused portion of the NESSF. An award from the NASA/Montana Space Grant Consortium will allow me to complete my Ph.D. program in Ecology and

Environmental Science at Montana State University. My goal post-graduation is to continue my research in icy environments and astrobiology as head of my own lab.

CMORE Summer Course:

11. What are your career goals and where do you see your professional development leading you over the next 5 years (300 words or less)?

Vast reaches of our planet remain unexplored or underexplored, even though they contain ecosystems integral to the functioning of our planet. Many of these are marine or aquatic, such as much of the world's oceans and the >100 km³ of liquid water thought to lie untouched beneath the Antarctic ice sheet. I am developing my doctoral research plan around the exploration of Antarctic subglacial lakes, with the goal being to characterize and quantify subglacial microbial activities. In the near term, I hope that my research will build understanding of how draining of subglacial fluids and microbes into the seas impacts oceanic nutrient cycling. In the long term, I am looking forward to building a career in microbial oceanography and limnology, supervising my own research group, and teaching. Over the next five years, I will complete and defend my dissertation research and graduate to the level of postdoctoral researcher. As a student, I will not only practice the scientific skills that I will need to build my career, but also prepare for the transition from student to teacher while working as a teaching assistant. I am currently a campus leader (co-chair of Women in Science and Engineering group) and an international leader (Microbial Ecology Discipline Coordinator for the Association of Polar Early Career Scientists). I plan to use these leadership experiences to hone my skills as a mentor and a communicator to the public. As society moves ever further into the information age, leaders in the sciences will unavoidably be called upon to communicate effectively with those outside of their field and outside of science. My overall goal is to combine excellence in science as a leader of my own research group with excellence in making that science accessible to the public as a writer and speaker.

Montana State University IGERT:

I have been studying the microbiology of extreme environments since 2006; first in the hot springs of the Great Basin desert, and currently in permanently ice-covered lakes of the McMurdo Dry Valleys of Antarctica. My interests are strongly rooted in ecology and

biogeochemistry, and I view these as interdisciplinary pursuits. Presently, my research focuses on the microbial dynamics of Dry Valley lakes during the transition to the polar night, specifically the question of how heterotrophic bacterial activity is sustained in these extreme ecosystems when, in the absence of light as an energy source for photosynthesis, photoautotrophic primary productivity is not a viable carbon source. This is essentially an ecological problem of supply and

demand, however, the nature of both the system and organisms being studied necessitate an interdisciplinary approach. Microorganisms interact intimately with the physico-chemical properties of their environment and thus, the Geobiology IGERT program at MSU provides a superb framework within which to address exactly this type of problem. I apply to the program in hopes of both continuing and expanding the scope of my research in icy environments, at the doctoral level.

I have chosen to pursue a Ph.D in Ecology and Environmental Science at MSU because as I have gained research experience, my ambitions have shifted from a concentration on assisting others with their projects, to goals that encompass designing experiments, conducting independent research, and someday mentoring students with similar goals, as well as affecting public policy decisions that are based on scientific advice. I believe that the structure of the IGERT program, including the laboratory rotations, coursework, and internships, will provide me with a strong foundation in geobiology, and as a result of its interdisciplinary framework, assist in supplementing my microbiology background with a greater understanding of geochemical processes. The IGERT program provides immediate benefits in the form of hands-on laboratory experience through rotations, while fostering the development of valuable long-term connections through internships with national and/or international colleagues and programs. After two seasons conducting research in Antarctica, it has become apparent to me that collaborative efforts, often international ones, are necessary elements of a successful research program. Such efforts beget a sharing of resources and expertise, which allow for more comprehensive sampling of an environment, greater breadth of experimentation, and more efficient use of funding. I look forward to taking advantage of both the practical lab experience and cooperative opportunities afforded to IGERT internship students. Finally, the IGERT program also addresses my long-term interest in interfacing with the public and with students through the outreach portion of the program. Having attended rural schools for most of K-12, and often seeing problems associated with insufficient resources for science programs, I am particularly interested in working with science teachers and students from rural areas. I feel that participation in the IGERT program will substantially enhance my academic, professional, and personal experience during my tenure as a graduate student at MSU, and I appreciate your consideration of my application.