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When people think of the microbial world, small and relatively innocuous organisms come to mind. At a cursory glance they seem simple in structure and function, but with quiet and relentless power, these organisms have the capacity to structure entire ecosystems. By developing a variety of metabolic strategies, microbes have inched their way into every environment possible. There are iron oxidizers, sulfate reducers, methanogens— if you can name it, there is a microbe that can make a living off of it. This outstanding diversity of lifestyles is what I hope to focus my research around.

My fascination with the microbial world began after being accepted into an NSF sponsored REU program to study phytoplankton ecology. Like most unacquainted with microbial life, I was uneasy about the subject matter. But from the moment I peered through the microscope and discovered the elegance of diatom and dinoflagellate structure, I was captivated. This was when I began to really consider the major roles microbes have in biogeochemical cycles. I studied them on a local scale, investigating phytoplankton community structure in relation to fluxes in the environment, but was also learning about their tremendous contributions to carbon cycling globally.

Following my interest in microorganisms further, I took courses in microbial and molecular ecology. One paper in particular had a large impact on my research focus. It examined microscale sulfur cycling in pink berry consortia from a salt marsh in Massachusetts (Wilbanks *et al.* 2014). I loved the extreme association between the bacteria within the “berries” and how it resulted in a functioning, tiny contained system. The juxtaposition of ecology and biochemistry was especially exciting to me. As one who could never fully reconcile whether they were an ecologist, microbiologist, or a (amateur) geologist, I was happy to find that I would no longer have to make that delineation by pursuing geobiology.

This paper also highlighted the fact that we know much less about smaller scale metabolic exchanges between microbes than overall microbial contributions to biogeochemical processes. I quickly became interested in resolving these interactions and understanding how they relate to greater biogeochemical cycles. My research interests are particularly well aligned with the goals Dr. K. His work focuses on the evolution, environmental activity, and metabolic controls of

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biogeochemical markers. This type of research allows us to more clearly study the physiological activities of microbes, which is necessary to connect microbial roles in biogeochemical cycling.

My background in ecology also prompts questions about microbial communities and how they function as a whole. More specifically, who are the key members in these communities and how are their activities connected? The growing geobiology group within the geoscience department houses research devoted to microbial interactions with minerals, biogeochemical cycling, and microbial physiology. As geobiology is a multidisciplinary science, I believe my interests will complement the group well, and will also benefit from the excellent resources and insights each of these groups offer.

Microbes underpin the structure of all ecosystems, and consequently understanding them is an important component in protecting the environment. In my future career I want to see my questions about microbial mediated biogeochemical processes develop into questions about how our understanding of them can be used to better protect the environment. Ideally I will conduct this research with an organization such as NOAA, whose foundation is set in understanding the complex systems that support our planet. The geology department at [Uni A] is home to a community of excellent researchers whose work embodies this goal, so I believe this graduate program will be a great place to cultivate my ideas and help me become a successful scientist.

*References*

Wilbanks, E.G., Jaekel, U., Salman, V., Humphrey, P.T., Eisen, J.A., Facciotti, M.T., Buckley, D.H., Zinder, S.H., Druschel, G.K., Fike, D.A. and Orphan, V.J. (2014), Microscale sulfur cycling in the phototrophic pink berry consortia of the Sippewissett Salt Marsh. *Environ Microbiol*, 16: 3398– 3415. doi:10.1111/1462-2920.1238