



**Adina Howe, PhD**  
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Dear members of the search committee:

I am thrilled to apply for an assistant professor position in the College of Engineering at Iowa State University. I am strongly interested in data-driven discovery and the integration of biological big data towards the study of natural microbial populations and their impacts on our environment and health. My current work focuses on understanding microbial communities by integrating interdisciplinary approaches including microbiology, microbial ecology, metagenomics, and computational biology. Currently, I am adjunct faculty at Michigan State and a computational biologist at Argonne National Laboratory where my research connects the dots between high throughput, next generation DNA sequencing and the microbial drivers of system performance in complex environments. I specialize in identifying the contributions of genes, individuals, and groups to population function and dynamics in microbial populations. My future research program will continue to focus on identifying emerging properties of natural and model ecosystems, leveraging high throughput datasets combined with novel experimental and computational approaches to investigate how microbial components within these systems can be understood and/or managed to solve real-world problems.

Though critical to our survival, there is much we do not understand about microbial interactions and the resulting impacts on our environment and health. My past work has contributed to the understanding of microbes at multiple scales, from revealing the mechanisms controlling a novel enzyme in a bacterial isolate (PhD, University of Iowa) to community-wide surveys of structure and function of microbial populations in soil and gut environments (Michigan State and Argonne National Laboratory).

My postdoctoral appointment at MSU (supported by the NSF Postdoctoral Fellowship in Computational Biology) provided a unique and important perspective for my current research. Advised by both James Tiedje (Director, Center for Microbial Ecology) and C. Titus Brown (Assistant Professor), my research developed approaches to characterize the microbial communities of important bioenergy crops and their contribution to nitrogen availability and fixation. During this time, I became acutely aware of the need to understand the details of our research questions in the context of the opportunities provided by enabling technology. For environmental investigations, a major barrier to leveraging sequencing technologies was that deep sequencing resulted in intractable, extremely large datasets. Working in collaboration with an interdisciplinary team, I developed novel computational approaches to work with these extremely large datasets and applied them to investigate soil and mammalian gut microbial environments. This software has developed into a suite of tools and tutorials (for both the biologist and the computational scientist) known as *khmer*, which is currently being used by hundreds of labs internationally.

Currently, I have continued the development and application of this research focused on understanding microbial communities dynamics in metabolic diseases of the mammalian gut and carbon cycling in bioenergy crop soil systems. Having participated in these projects since their early stages, I have been able to leverage my previous experiences with large datasets and complex environments to design appropriate experiments to target specific research questions aimed at understanding microbial drivers of function (e.g., disease in mice, carbon cycling in soil).

As a part of the dynamic research community at ISU, my program will continue to focus on a systems biology approach to understanding how ecosystems and microbial components contribute to the health of a system. My lab will specialize in leveraging molecular microbiology using cutting edge techniques in experimental design, comparative microbial genomics, omic-based approaches, and computational biology to begin to understand how microbes act as communities in concert rather than as isolated individuals, their effects on host and landscape health, and the implications these systems have for our lives.

My training and research experiences offer many opportunities to explore a broad range of important questions as well as provide undergraduate and graduate training in biology, microbiology, genetics, and bioinformatics. I am excited about the prospect of joining ISU and establishing new collaborations that provide me with the opportunity to continue expanding the boundaries of biological discovery with data driven science. Thank you for your consideration of my application, and please feel free to contact me if I can be of any assistance.

Sincerely,

A handwritten signature in black ink that reads "Adina Howe". The signature is written in a cursive, flowing style.

Adina Howe

Enclosed: C.V. with attached research statement and references