The Amend Lab at the University of Hawai'i at Mānoa is seeking a post-doctoral researcher to work on a National Science Foundation-funded study entitled "MIM: Using Machine Learning and a Model Watershed to Understand how Microbes Govern Food Web Architecture and Efficiency". A synopsis of this project can be found below.

We are looking for applicants with expertise in one or more of the listed areas:

- Microbial comparative genomics, metagenomics and functional analyses of microbiomes
- Ecology of host-associated symbiotic systems
- Food web ecology

The researchers will help develop specific research questions, and experiments to understand how: 1) microbiome communities assemble among trophic levels within food webs, and 2) the mechanisms of how microbiomes impact food web efficiency and complexity. Researchers will make use of a tractable model food web microcosm/mesocosm system including microbial isolates, axenic invertebrate hosts, and will leverage genomic data to resolve microbial roles constraining transfer of energy among trophic levels.

Minimum qualifications include:

- A PhD in Biology, Ecology, Computer Science or a related scientific discipline.
- Research experience in one or more of the following fields: genomics, microbial ecology, food web ecology, microbiology, fungal biology.
- Evidence of scientific productivity in the form of peer-reviewed publications.
- Strong science writing and communication skills.
- Ability to work independently as well as a productive member of a team, including mentoring experience.

The postdoc will be expected to carry out a portion of the work outlined in the NSF-Rules of Life project, but will also have the option of developing studies within their specific areas of interest as they relate to microbiomes. This includes potential collaborations with the Center for Microbiome Analysis through Island Knowledge and Investigation (C-MĀIKI; https://www.c-maiki.org/), and collaboration with labs of the CoPIs: Nicole Hynson, Matthew Medeiros and Peter Sadowski. Pay is commensurate with experience (pursuant to NIH pay scale), start date is somewhat flexible, and appointment is initially for one year with the possibility to extend for an additional 1-2 years provided acceptable progress.

To apply:
Job will be posted until March 9, 2023.
Interested parties should apply on the RCUH Website: www.RCUH.com, search job ID 223099.

Please include in your cover letter a brief outline of your background relevant to the project and how you meet the minimum qualifications, and your experience analyzing microbial genomes and meta-genomes Informal inquiries are welcomed at **Amend@hawaii.edu).**

Project Synopsis:
Rules that govern food web dynamics, which describe how energy is transferred among different living organisms, are among the most universal laws of nature. Consumption up a food-chain is an inherently inefficient process that leads to significant and predictable losses through waste and respiration. This rule of life can be leveraged to model how biological diversity will respond to phenomena such as sudden changes in the environment or species extinctions, and is an important constraint in food production. Until now, food web research has focused largely on the interactions among plants and animals, however, microbes living in and on larger organisms play essential roles in their health, rates of reproduction, and ability to metabolize food. This project will examine how symbiotic microbes govern the efficiency of food webs, and how aspects of food webs, in turn, determine the composition of symbiotic microbes. The predictive insight gained from this research may make it possible to manipulate the composition of microbes to create more efficient food webs that can potentially guide restoration of degraded habitats, capture carbon, and increase yield in agriculture, aquaculture and biofuels systems.

This project addresses the hypothesis that canonical laws governing the transfer of energy among trophic levels of food webs both constrain, and are constrained by the composition and function of microbiomes. Leveraging a model Hawaiian watershed system, this project aims to understand how host-associated microbiomes govern food chain efficiency and how, in turn, trophic position within a food web affects the microbiome. The project will develop transfer learning approaches based on machine-learning tools trained on higher-feature datasets (such as the Earth Microbiome Project) to enable robust predictions of the interaction between food chain length, trophic position and microbiome diversity. Two tractable experimental systems will be used to explore these predictions. The first is a simple four-tiered bromeliad food web mesocosm where the number and of trophic levels is controlled. The second consists of a three-tiered mosquito microcosm in which all microbial symbionts are isolated and manipulated. Associated genomic data will enable a mechanistic understanding of how microbiomes influence food web efficiency and function by altering metabolic capacity of hosts. In summary, this project will employ food web theory to explain and predict the interactions between the microbiome, the host, and the environment.