PhD Studentship: Industrial strength eco-evolution: artificial selection of microbial communities

Microorganisms are central to many biotechnologies, including the synthesis of many chemicals, the production of biofuels from algae and the bioremediation of water contaminated by oil. The use of complex communities represents the next frontier in microbial biotechnology. Ecological and evolutionary theory can inform efforts conducted to assemble such useful communities or isolate them from wild environments. The process of producing and maintaining these communities also provides the ideal test bed for these same ecological and evolutionary theories.

The PhD Student will use artificial selection to increase a trait value of interest in complex communities of microorganisms. Artificial selection allows us to force a link between the fitness of communities and a desired trait value. This link can counteract natural selection and ensures the proliferation of the desired community type. The trait can be a biochemical character such as chlorophyll concentration or a service such as the rate of degradation of a pollutant. The student will use high-throughput methods including microtiter plate assaying and cell-sorting flow-cytometry to characterize the communities and apply selection. This will be used to test the factors that affect the rate and final amount of change in a trait value under selection.

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Keywords: algae, evolution, adaptation, experimental, chlorophyll, ecological interactions, biodiversity, meta-community