“Leaf-cutters and honeypots: Ant-microbe symbioses as models for microbial ecology and evolution”

Abstract: Microbial ecology and evolution are fascinating and important fields as they relate to many of earth’s processes but can be challenging to study in complex natural systems. To be able to study microbes in their natural habitats without artificially simplifying their communities, my lab studies natural microcosms. These are microbial assemblages like those found inside of pitcher plants, and those associated with insects. This talk will primarily focus on my work with ant-associated microbes, first those in leaf-cutter ant fungus gardens, and then those found in the guts of honeypot ants. Leaf-cutter ants grow a fungal cultivar that they feed fresh leaves to. They have an obligate mutualism with this fungus that is responsible for enzymatically digesting plant material to deliver energy to the ants. This obligate mutualism has evolved over 60 million years and provides a paradigmatic example of coevolution. The fungus, and a community of bacteria that live in the fungus gardens, both help to mediate barriers to plant consumption, such as recalcitrant biomass, low nutrient content, and toxic plant defense compounds. While the leaf-cutter ant system has been studied for many years, the honeypot ant system is (in my opinion) vastly understudied. Honeypot ants are characterized by specialized workers called repletes, which have gasters that can swell to huge proportions with sugary liquids, and which serve as the colony's food storage system during times of scarcity. Repletism has evolved independently, through convergent evolution, in at least six genera around the world in semi-arid habitats where these ants live. I hope to uncover whether these ants have a resident gut microbiome, and whether the microbiome may also have converged in its community composition and in terms of its potential function.