Symbioses between macro-organisms and microbes are often defined by the method of transmission from one host to another. Heritable microbial symbionts often function as mutualists, ensuring the successful survival of the host. Theory predicts that populations which have exclusively vertical transmission should result in fixation of beneficial symbionts, yet many populations experience an intermediate rate of symbiosis with heritable symbionts, mixtures of symbiotic (S+) and non-symbiotic (S-) hosts. The drivers of variability of heritable microbial symbiont prevalence are poorly understood. Coexistence theory provides a framework to identify and quantify the contributions of fluctuation-dependent mechanisms and fluctuation-independent mechanisms to a stable coexistence of S+ and - individuals.I hypothesize that fluctuation-dependent mechanisms, and specifically the spatial storage effect, are dominant promoters of local, stable coexistence between S+ and S- hosts in fungal endophyte plant interactions.

I collected data that shows distinct responses of S+ and S- grasses to local soil moisture, indicating the presence of endophytic fungi modifies the environmental responses of their hosts, which suggests that fluctuation-dependent mechanisms are currently at work in this system. I conducted a response surface experiment to measure the competition coefficients of S+ and S- grasses across various densities and environmental gradients, as used in other coexistence investigations. I planted S+ and S- individuals either isolated and next to different densities of S+ or S- individuals in a factorial design that crosses density and symbiont frequency. Better understanding of this would advance the ability to make predictions about conditions that strengthen or weaken host-symbiont mutualism.