

日 時 : 2026 年 8 月 7 日 (金) 16:00-17:00

場 所 : 本部アネックス棟 第 1 会議室

タイトル : **Harnessing the "Earth's Breath": Translating
Plant-Microbiome Negotiations from Pine Evolution to
Sustainable Agriculture**

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In traditional Chinese philosophy, "Earth's Breath" (地氣) describes the land's vital energy flow. Biologically, this manifests as plant-soil feedbacks driven by cellular oxidative metabolism across the electron transport chains, gradually converting organic matter into mineral nutrients. Unlike the gentle energy flow of decomposition, wildfires represent an unruly oxidation. Traditionally, plants are viewed as passive, while we hypothesized that plants are active *holobionts* that dynamically guide microbial functions to regulate Earth's Breath. This talk explores this paradigm through natural and agricultural ecosystems.

First, comparing fire-adapted pines reveals distinct evolutionary strategies. Fire-avoiding pines (*Pinus morrisonicola*) promote rapid decomposition and robust nitrogen cycling, sustaining their nutrients by continuously flowing with Earth's Breath. In contrast, fire-tolerant pines (*P. taiwanensis*) may intentionally suppress soil decomposition, effectively holding Earth's Breath to await the massive nutrient release of a post-wildfire reset.

Shifting to agriculture, we examine how anthropogenic nitrogen investment disrupts Earth's Breath in maize fields, causing excessive root organic nitrogen release that increases crop's energy cost. Applying peptide-based biostimulants recalibrates this relationship, in part by suppressing microbial nitrate assimilation pathways, allowing maize to conserve energy, improve Nitrogen Use Efficiency (NUE), and boost yield.

Ultimately, a plant's prosperity depends on negotiating with Earth's Breath. While pines evolved to either flow with or suppress this energy, modern agriculture must actively recalibrate disrupted flows. Through shotgun metagenomics, we can monitor these underground energetic states, providing cues for building a climate-resilient ecosystem.

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