Abstract Submitted
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Collective Cellular Decision-Making Gives Developmental Plasticity: A Model of Signaling in Branching Roots[1] W. TYLER MCCLEERY, NADIATUL A. MOHD-RADZMAN, VERONICA A. GRIENEISEN, John Innes Centre — Cells within tissues can be regarded as autonomous entities that respond to their local environment and signaling from neighbors. Cell coordination is particularly important in plants, where root architecture must strategically invest resources for growth to optimize nutrient acquisition. Thus, root cells are constantly adapting to environmental cues and neighbor communication in a non-linear manner. To explain such plasticity, we view the root as a swarm of coupled multi-cellular structures, "metamers", rather than as a continuum of identical cells. These metamers are individually programmed to achieve a local objective - developing a lateral root primordia, which aids in local foraging of nutrients. Collectively, such individual attempts may be halted, structuring root architecture as an emergent behavior. Each metamer's decision to branch is coordinated locally and globally through hormone signaling, including processes of controlled diffusion, active polar transport, and dynamic feedback. We present a physical model of the signaling mechanism that coordinates branching decisions in response to the environment.

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W. Tyler McCleery
John Innes Centre

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