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**Modeling Intracellular Oscillations and Polarity Transition in Fission Yeast** TYLER DRAKE, Lehigh University, MAITREYI DAS, FULVIA VERDE, Miami University, DIMITRIOS VAVYLONIS, Lehigh University — Fission yeast, a pill-shaped model organism, restricts growth to its tips. These cells maintain an asymmetric growth state, growing at only one tip, until they meet length and cell-cycle requirements. With these met, they grow at both. The mechanism of this transition, new-end take-off (NETO), remains unclear. We find that NETO occurs due to long-range competition for fast-diffusing signaling protein Cdc42 between the old and new tips. From experimental results, we suppose that symmetric tips compete for Cdc42, which triggers growth. We describe a symmetric growth model based on competition between tips. This model restricts short cells to monopolar states while allowing longer cells to be bipolar. Autocatalytic Cdc42 recruiting at both cells tips leads to broken symmetry, and the recruiting cuts off as tip Cdc42 levels saturate. Non-linear differential equations describe the model, with stable attractors indicating valid distributions. Linear stability analysis and numerical methods identify stable fixed points over a twofold increase in cell length. The model reproduces qualitative behavior of the organism. We show that observed pole-to-pole Cdc42 oscillations may facilitate the polarity transition and discuss their relationship to the Min system in E. Coli.

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