Seminar/Talk

A comprehensive view on pattern formation by the Min Proteins in vivo and in vitro

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Intracellular processes must be precisely organized in space and time. A paradigmatic example is the symmetric division of bacteria, which, in E. coli, is orchestrated by the ATP-driven oscillation of Min proteins between the cell poles. Remarkably, two proteins of the Min system are sufficient for this pattern-formation process. Even so, this seemingly simple system forms a kaleidoscope of different reactiondiffusion patterns in vitro, without clear connections to the in vivo patterns. We lack a comprehensive understanding of the patterns in vivo and in vitro. Here, we show theoretically that changes in the membrane-binding of one of the proteins, MinE, explain the differences between patterns in vivo and in vitro. We verify this prediction in vitro by constructing pattern phase diagrams using wild-type proteins and by removing MinEs membrane targeting sequence. This shows that a conceptual reactiondiffusion system grounded in the known biochemistry of the Min proteins captures their diverse spatiotemporal self-organization quantitatively, offering an instructive platform to study the physiological implications of and the physical principles underlying the rich phenomenology of intracellular protein patterns.

Thursday, August 28, 2025 10:00am - 11:00am
Office Bldg West / Ground floor / Heinzel Seminar Room (I21.EG.101)

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