Seminar/Talk

Self-organization and molecular transport by bacterial protein systems

Beatrice Ramm
Friedrich Miescher Laboratory of the Max Planck Society

Host: Martin Loose

A hallmark of living systems is self-organized pattern formation: the partitioning of molecules and cells into distinct spatial domains with different functions. But self-organization phenomenaexhibit complex behavior that cannot be predicted from their components, complicating theirinvestigation. To overcome this challenge, our research uses bottom-up and mammalian synthetic biology approaches to quantitatively describe the molecular mechanisms and emergent properties of self-organizing systems. In this talk, I will describe with two examples how we study the pattern formation of bacterial protein systems using in vitro reconstitution techniques.The first example is the Escherichia coli MinDE system, which positions the cell division site and has become a model for pattern formation because it self-organizes into traveling surface waves and other patterns when reconstituted. Using this technique, we discovered that MinDE can transport unrelated cargo molecules via a nonspecific mechanism termed diffusiophoresis.The second example consists of a phosphatidylinositol (PI) lipid kinase, MavQ, and a phosphatase, SidP, two effector proteins of the intracellular pathogenic bacterium Legionella pneumophila, thathave been shown to remodel ER membranes of the eukaryotic host cell, while exhibiting dynamics. We could show that MavQ and SidP also self-organize into dynamic patterns that enrich their substrate lipids in vitro. I will discuss how MavQ/SidP self-organization differs from established systems such as E. coli MinDE, suggesting it may be a promising new paradigm for the study of protein pattern formation.

Thursday, November 20, 2025 01:00pm - 02:00pm
Central Bldg / O1 / Mondi 2a (I01.O1.008)

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