



Seminar/Talk

Spatial organization and performance of microbial communities

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Microbial communities play an important role in many processes on our planet, from the cycling of elements on Earth to human health and disease. Understanding the development and dynamics of microbial communities is thus an important goal. Most interactions inside microbial communities are local: some require direct contact between cells, while others are mediated by diffusion of compounds through the environment. The growth and survival of an individual cell is thus influenced by the identity and activity of other cells that live nearby. This raises the question of how different cell types arrange in space. Do they attain an arrangement that promotes beneficial cell-cell interaction and maximizes growth of the community? Can this arrangement be maintained in time as the community grows and develops? We investigate such questions with simple synthetic microbial communities. We study a mutualistic consortium of two interacting species and we investigate how the two species organize in space and how this spatial organization determines how well the community as a whole can grow. Using a combination of microfluidics and time-lapse microscopy, we follow the development of the community in time and in a controlled environment. We observe the community at a spatial resolution that allows to measure both the growth of the individuals and of the community as a whole, and for this measurements we develop specialized image analysis software. We established that the growth of an individual depends on who its neighbours are, and that interestingly the two species interacts with a different number of neighbours. We also find that the growth of the community depends on the arrangement of the two species in space. To understand how the local properties of individuals translate into the global properties of the community, we combine experiments with individual-based modeling. Our work contributes to understanding how properties of biological communities emerge from the individual components and their interactions. Natural microbial communities are incredibly diverse in terms of number of different organisms and interactions and understanding their functioning is a problem of extraordinary difficulty. We tackle this problem using bottom-up research that aims at identifying basic principles in simpler experimental set-ups.

Thursday, November 30, 2017 03:00pm - 04:00pm

Mondi Seminar Room 1, Central Building



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