FriSBi

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 thusan important goal. Most interactions inside microbial communities are local: somerequire direct contact between cells, while others are mediated by diffusion ofcompounds through the environment. The growth and survival of an individualcell 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 theyattain an arrangement that promotes beneficial cell-cell interaction and maximizesgrowth of the community? Can this arrangement be maintained in time as thecommunity grows and develops?We investigate such questions with simple synthetic microbial communities. Wes t u d y a mutualistic consortium of two interacting species and we investigate howthe two species organize in space and how this spatial organization determineshow well the community as a whole can grow. Using a combination of microfluidicsand time-lapse microscopy, we follow the development of the community in timeand in a controlled environment. We observe the community at a spatial resolutionthat allows to measure both the growth of the individuals and of the community asa whole, and for this measurements we develop specialized image analysissoftware. We established that the growth of an individual depends on who itsneighbours are, and that interestingly the two species interacts with a differentnumber of neighbours. We also find that the growth of the community depends onthe arrangement of the two species in space. To understand how the localproperties 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 communitiesemerge from the individual components and their interactions. Natural microbialcommunities are incredibly diverse in terms of number of different organismsand interactions and understanding their functioning is a problem ofextraordinary difficulty. We tackle this problem using bottom-up research thataims at identifying basic principles in simpler experimental set-ups.

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

Mondi Seminar Room 1, Central Building

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.