UniSysCat Colloquium

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Start Time: Wednesday, April 24, 2019 05:15 pm

End Time: Wednesday, April 24, 2019 06:45 pm

Chemistry Building, C264
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Signaling pathways in context – Integration of mathematical modeling in time and space with dedicated experiments on different scales

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Theoretical Biophysics

The yeast *Saccharomyces cerevisiae* is frequently used as the model organism for eukaryotic cells allowing to comprehensively analyzing regulatory networks and to collect massive amounts of data of different types. Here, we consider that yeast cells have to respond reliably to changes in the environments irrespective of their current state. They must integrate stress response with ongoing processes such as cell cycle. Different well-organized and highly regulated processes have to contribute to successful survival. Understanding the complex relationship between regulatory networks and cell growth is still a challenging task.

It is of interest that baker's yeast can engage in a mating process where haploid mating types *MAT*a and *MAT*a cells can also mate to form diploid cells again. To this end, they secrete the pheromones **a**-factor and **a**-factor, sense the opposite pheromone and form protrusions in the direction of a potential mating partner. Importantly, they cannot move towards their mating partner, thus, the formation of the mating shape called shmoo is a significant growth investment.

Combining experimental studies of the cellular responses to mating factor and the resulting shape changes with spatial mathematical modeling, we investigated three major steps in the mating process. Specifically, we asked the following questions: (I) How do yeast cells

communicate to form sharp gradients of pheromones allowing for precise decisions about whether to engage in mating or to continue dividing instead? (II) How do the individual cells sense the resulting gradients and how do they implement this information in order to decide about the spatial location of the polarization spot and later mating project? (III) How do they translate the sensed information into shape changes, i.e. directed growth?

Here, we combine different modeling techniques to understand stress response, cell cycle regulation, and mating in changing environments, with specific focus on the interplay of different regulatory networks. The results indicate that yeast cells have developed different mechanisms for coping with external stress during different periods of their life time.

Prof. Dr. Maria Andrea Mroginski

Organizer