Systems and Synthetic Biology Seminar

10/5 (Wed) 15:00 - 16:00 D105 seminar room

Antoine Danchin, PhD

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From functions to structures: Constraints on the cell chassis for synthetic biology

Most studies in Synthetic Biology focus on the design of novel piece of genetic programs. Yet, if cells are computer making computers, the programs have to be read by a machine. The master function of a cell (be it natural or synthetic) is to produce a young progeny and explore its environment. The corresponding helper functions can be identified from extant genome sequences. We will show that this allowed us to identify at least half of the "unknown" functions of the recent synthetic Mycoplasma JCVI 3.0. We will further show that this view allows us to reverse the standard scenarios for the origin of life, allowing us to identify a class of innocuous chassis, based on Archaea. Finally we will discuss about the role of ageing in all living cells, and see how this may impact the construction of synthetic biology contraptions.

organized by the Laboratory of Systems Microbology

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Agnieszka Sekowska, PhD
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An unforeseen cause for adaptive mutations: ageing bacterial colonies display mutation hotspots How do ageing bacterial colonies generate adaptive mutants?

We designed "intelligent" bacteria able to find a solution to produce a progeny surviving in an environment where the parent cells could not multiply. Using NGS techniques we subsequently identified all mutations in the genome of the strains carrying the adaptive mutations. This allowed us to uncover that on-going transcription is a mutation-generating pathway that accounts for the observations. Interestingly, the explanation we propose lies in-between a Darwinian stance applied to the whole genome, and a more Lamarckian stance where random mutations are located within genes that keep being transcribed as cells age. Were this process generalized to multicellular organisms it would bring about a fertile contribution to the initiation of cancer that parallels ageing.

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