LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

ARNOLD SOMMERFELD CENTER FOR THEORETICAL PHYSICS

Sommerfeld Theory Colloquium

Prof. Ned Wingreen

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Modeling microbial diversity

Metagenomics has revealed hundreds to thousands of microbial species coexisting in almost all microbiota. It is increasingly appreciated that microbial communities condition their own environments. To better understand the role of this environmental conditioning in promoting diversity, we physically model the population dynamics of microbes that compete for steadily supplied resources. In a model where cells require multiple nutrients, we find that population dynamics generally leads to the coexistence of different metabolic types, which satisfy an extended competitive exclusion principle. Moreover, we establish that these consortia of metabolic types act as cartels, whereby population dynamics pins down resource concentrations at values for which no other strategy can invade. Strikingly, these cartels also yield maximum biomass, constituting a microbial example of Adam Smith's "invisible hand" leading to collective optimal usage of resources. Curiously, in a model where only total resource acquisition is considered, diversity can arbitrarily exceed that predicted by the competitive exclusion principle.

Wednesday, 5 July 2017, 16:15h, Room A348/349, Theresienstr. 37/III

Prof. Ulrich Gerland (TUM), Prof. Erwin Frey