Cologne Evolution Colloquium

Joint Seminar with

Theoretisch Physikalisches Kolloquium

CRC 1310 Predictability in Evolution

Debashish Chowdhury
IIT Kanpur, Indien

Ubiquity of Michaelis-Menten input-output relation: conditions on the network of states

The input-output relations of a biological system summarize its functional characteristics. Therefore, answering many fundamental questions on biomolecular machines ultimately reduce to understanding their input-output relations. Enzymes, that catalyze biochemical reactions, are among the simplest chemo-chemical machines for which both input and output are chemical in nature. Many enzymatic reactions follow the "Michaelis-Mentenrelations between input concentrations and output concentration of the molecular species involved in the reaction. We begin with a graph theoretic analysis of the input-output relation of a single enzyme. Input-output response of a graph can be characterized by the steady-state concentrations of the vertices. We present the conditions that must be satisfied by the structure of the graph (network) of states for the validity of the Michaelis-Menten input-output relation [1]. This analysis sets the stage for understanding, at the next level of complexity, the input-output relation of a molecular machine, that is a macromolecular complex, and then at an even broader context of a group of interacting machines. I'll present an overview of our recent results on these input-output relations at multiple scales.

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Institute for Biological and Theoretical Physics
Zülpicher Str. 77a
Seminar Room 0.03, Ground Floor

Hosted by Joachim Krug