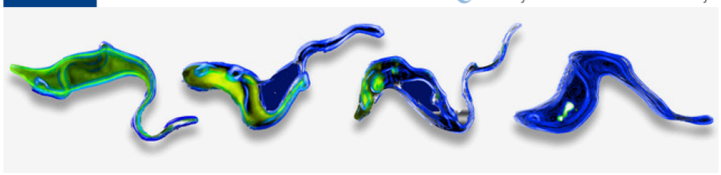

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Signature of (anti)cooperativity in the stochastic fluctuations of small systems: application to the mechano-sensitive assembly of the bacterial flagellar motor

The cooperative binding of molecular agents onto a substrate is pervasive in living systems, particularly stochastic processes inside cells. When the number of binding sites is small enough, we can rely on a fluctuation analysis of the number of substrate-bound units, an experimentally accessible quantity, to study whether a system shows cooperativity.

First, we present a general-purpose grand canonical Hamiltonian description of a small one-dimensional (1D) lattice gas with either nearest-neighbor or long-range interactions as prototypical examples of cooperativity-influenced adsorption processes. We propose 1) a criterion to determine whether a given adsorption system exhibits cooperative or anti-cooperative behavior and 2) a method to quantify the amplitude of the ligand-ligand interaction potential.

Second, we compare the theoretical predictions of our model to bead assay measurements of the bacterial flagellar motors (BFM) of *E. coli*. In this way, we find evidence that cooperativity controls the mechano-sensitive dynamical assembly of the torque-generating units, the so-called stator units, onto the BFM. Finally, we estimate the stator-stator interaction potential and attempt to quantify the *adaptability* of the BFM.

References:

1 Franco-Oñate M-J, Parmeggiani A, Dorignac J, Geniet F, Walter J-C, Pedaci F, Nord A L, Palmeri J, Walliser N-O (2023). *Signature of (anti)cooperativity in the stochastic fluctuations of small systems: application to the bacterial flagellar motor.* \[arXiv:2307.00636\]

2 Perez-Carrasco R, Franco-Oñate M-J, Walter J-C, Dorignac J, Geniet F, Palmeri J, Parmeggiani A, Walliser N-O, Nord A. (2022). *Relaxation time asymmetry in stator dynamics of the bacterial flagellar motor.* Science Advances, 8(12), eabl8112, \[bioRxiv:451114\]

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