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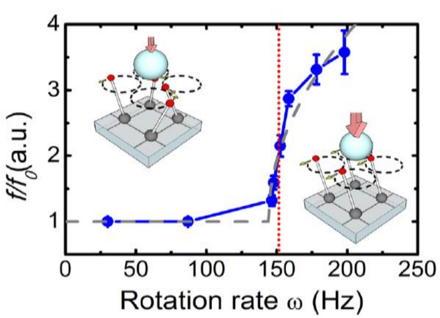
Biological motor, Network fluctuation, Neuron, Polymer physics

The abrupt increase of the force of bacterial flagella and synchronization: This study uses Oseen tensor to calculate the hydrodynamic interaction induced collective motion of bacterial flagella at low Reynolds numbers and its relation to the flagellar force to understand the experimentally observed phenomenon (Fig. 1) of "abrupt increase of force at a threshold rotational speed" [Appl. Phys. Lett. (2014)].

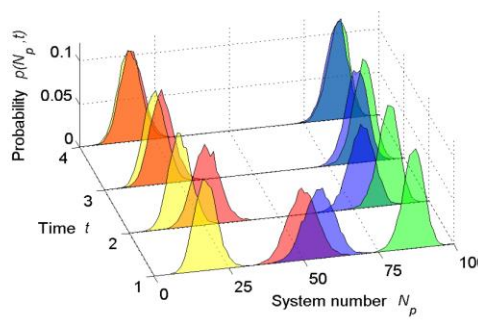
The phase diagram of neuron pain and signal bifurcation: This work unravels that a local channel density heterogeneity may trap, reflect, filer a neural signal or form a spontaneous or stimulated signal source, and shows various attractors and bifurcations. It provides knowledge in manipulating neural signals and probably in hypersensitive pain. Fig. 3: neural signals around a spontaneous source, [New J. Phys. (2013)].

Measurement uncertainty of biological receptors and stochastic lumping theory: Kinetic networks are widely used for studying complex systems. This work proposes and applies the stochastic lumping theory to reveal the relations of (intrinsic or extrinsic) noises between hierarchical networks to analyze the measurement limit of biological receptors in chemotaxis. Fig. 2: the increasing lumpability indicates entropic production [J. Chem. Phys. (2015)].

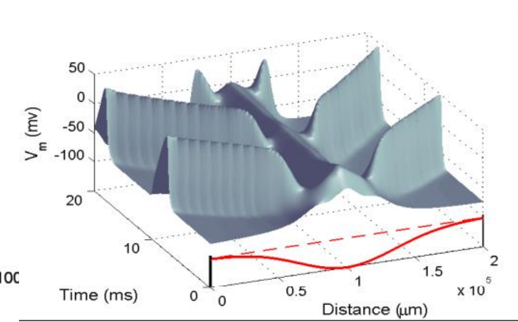
DNA polymer translocation and entropy formula: DNA translocation is a hot topic in single molecule experiments. In this scale, the entropy force might be the most elusive interaction and usually can only be calculated by computers. This work develops a formula, enabling a quick force estimation by hand. It reveals the universal upper and bottom limits of various entropic forces and gives an estimation to them in various polymer systems [preprint].



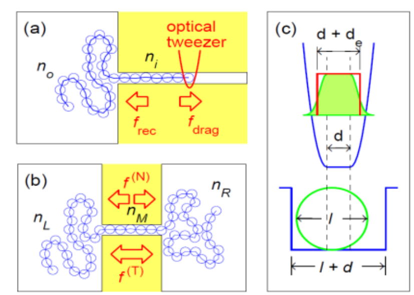
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)