

The Other Bohr and Biology's Greatest Model

Thursday, August 10, 2023 9:50 AM (50 minutes)

Only ten years after the discovery of the iconic structure of DNA, new questions were on biologist's minds, namely, how are the macromolecules of the cell regulated so that they do what they are supposed to when and where they are needed. The initial resolution of the challenging question of biological regulation came in the form of the notion of "allostery", an idea that its discoverer Jacques Monod himself referred to as "the second secret of life". We recently celebrated the 50th anniversary of the classic paper of Monod, Changeux and Jacob that introduced this far reaching idea. That important paper was followed shortly thereafter by a second one that revealed their musings on how simple statistical mechanical models can be used to capture how such allosteric transitions work mechanistically. In this talk, I will review the key features of the famed Monod-Wyman-Changeux (MWC) model and then describe its broad reach across many different domains of biology including the famed Bohr effect in hemoglobin. In this talk I will make special reference to the physics underlying how genes are turned on and off. One of the intriguing outcomes of this class of models is a beautiful and predictive scheme for collapsing data from entire libraries of mutants. Once we have considered some of the traditional uses of the MWC model, I will turn to more speculative recent ideas which use the MWC approach to consider the nature of kinetic proofreading.

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