

**Molecular synchronization in metabolic pathways**

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Enzymes often operate as molecular motors, undergoing ordered sequences of large conformational motions in order to perform their catalytic activity. We study the collective dynamics of arrays of allosteric enzymes and investigate possible synchronization of their conformational cycles. We consider both simple systems with one single enzyme species and more complex pathways including different enzyme-catalyzed reactions. We show that synchronization can give rise to oscillations with time-period of the order of the duration of individual reaction events. Such oscillations arise from coordination at a molecular level, and are therefore essentially different from known periodic phenomena such as glycolytic oscillations with time scales of several minutes. We address the question whether real metabolic pathways in living cells can exhibit such molecular synchronization and compare our theoretical results with published experiments.