MAR06-2006-040197

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Building a cellular oscillator from metabolic and cell signaling components

JAMES LIAO, UCLA

One of the key features of cellular oscillators is their interaction with metabolism and cellular physiology. To understand such interaction and to uncover operating principles behind these networks, we designed a synthetic gene-metabolic oscillator that links metabolism with gene regulation. The conceptual design was inspired by physical and mathematical insight, but constrained by biological and chemical realities. Biological implementation was built on detailed understanding of the physiology of the organism of interest. Non-linear dynamic analysis was used to guide the search of experimental conditions and evaluate different design. Interestingly, most of the predictions were experimentally verified, suggesting that the underlying mechanisms were properly captured by the conceptual and mathematical models.