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Nonlinear dynamics of beating cardiac cells

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Abstract

The observation of spontaneous calcium oscillations of $\sim 1\text{Hz}$ in beating cardiac cells is typically explained by many coupled chemical reactions and parameters. We show that the separation of time scales of fast processes with slower calcium diffusion in the cell results in a single, non-linear dynamical equation that characterizes these oscillations with only a few physically relevant parameters. Motivated by recent experiments, we predict how the beating can be entrained to an external, oscillatory electric or mechanical strain field and compare our predictions for the onset of entrainment to measurements. We further demonstrate, both experimentally and theoretically, that a much slower time scale (minutes to hours) can be extracted from analysis of the noisy dynamics of beating.

Date & Location:

Tuesday, March. 26, 2019, 11:00
Lecture room, Physics Building (ground floor)