iTHEMS Colloquium

# Systems Biology of Cellular Rhythms


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**Suzuki Umetaro Hall, RIKEN Wako Campus**

R-CCS #305-2, Kobe
SUURI-COOL (Kyoto)
AIMR Main Build., 2F Seminar Rm., Sendai


Rhythmic phenomena occur at all levels of biological organization, with periods ranging from milliseconds to years. Among biological rhythms, circadian clocks, of a period close to 24h, play a key role as they allow the adaptation of living organisms to the alternation of day and night. Biological rhythms represent a phenomenon of temporal self-organization in the form of sustained oscillations of the limit cycle type. Mathematical models show how the emergent property of oscillatory behavior arises from molecular interactions in cellular regulatory networks, which explains why cellular rhythms represent a major research topic in systems biology. After providing an introduction to biological rhythms and their modeling, I will focus on mathematical models for two major examples of rhythmic behavior at the cellular level: the circadian clock and the cell cycle. The coupling of these rhythms allows for their synchronization and for the occurrence of more complex patterns of oscillatory behavior. I will discuss the reasons why models for cellular rhythms tend to become more complex, upon incorporating new experimental observations. The case of cellular rhythms allows us to compare the merits of simple versus complex models for the dynamics of biological systems.