Dynamics of biological slow-fast systems

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Multiple timescales are ubiquitous in models of real-world phenomena. For instance, many important biological processes evolve on different time scales and therefore consist of slow and fast components, think of neural and cardiac rhythms. Differential equations involving variables evolving on widely different time scales yield rich and notoriously hard mathematical questions. Geometric methods and dynamical systems theory play important roles in the study of such systems.

In this talk I will discuss some of the main concepts from so-called geometric singular perturbation theory for slow-fast systems and geometric desingularizion based on the blow-up method. Finally, non-trivial applications arising in cell biology and neuroscience will be presented.