Multiscale Dynamics in Biological Systems

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Instrument	Collaborative research project
Description	The theme of this research project is to apply the theory of slow-fast systems, in particular geometric singular perturbation theory (GSPT), to mathematical models of biological systems to understand physically relevant and dynamically complex phenomena such as mixed-mode oscillations composed of patterns of interchanging small- and large-amplitude oscillations. The project will strengthen the collaboration between the proposing researchers at UNIPD and Monash who have been investigating mixed-mode oscillations observed in a model of insulin pancreatic beta-cells with multiple timescales using GSPT. The project will allow concluding this study, which will likely lead to a publication in a high-impact journal. The collaboration will be further strengthened and extended by organizing a workshop on multiple-timescale biological systems in the fall 2022 at the Monash University Prato Centre.
Expected results	Besides allowing direct interaction between the groups at UNIPD and Monash, it establishes new and strengthens existing contacts to other research groups working on slow-fast dynamics both from a theoretical and applied perspective, in Europe, Australia and USA. The project will provide a deeper understanding of complex biological dynamics.