Abstract for

Chemogenetic fluorescent sensors for studying the role of forces and tension in intracellular trafficking

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This interdisciplinary project aims at developing real-time chemogenetic fluorescent tension sensors to study the role of mechanical forces and tension in intracellular trafficking. Physical forces exerted and experienced by cells are fundamental for regulating their functions, organization, and overall behavior. Mechanical forces regulate numerous biological processes, including cell migration, differentiation, proliferation, and apoptosis. This PhD project has two main aims: (1) design a novel series of fluorogenic chemogenetic fluorescent tension sensors for the real-time monitoring of mechanical forces in cells; (2) study force transduction and its impact on the secretory pathway. To design chemogenetic tension sensors, we propose to couple force-sensing modules with a reporter module based on the CATCHFIRE technology. Our approach will enable to create sensors with high dynamic range and fast response for examining mechanical forces across proteins during various processes. In particular, the designed sensors will allow us to study the role of forces in coupling focal adhesions engagement and protein trafficking. Overall, this project at the interface of chemogenetics and cell biology seeks to develop tools for quantifying mechanical forces in cells in order to provide insights on their role in various cellular functions.