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Conferencia: Mechanical interaction of ATP synthase with lipid membranes

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Título: Mechanical interaction of ATP synthase with lipid membranes

Abstract: ATP synthase is a rotating membrane protein that synthesizes adenosine triphosphate (ATP) through a proton-pumping activity across the membrane. To unveil the mechanical impact of this molecular active pump on the bending properties of its lipid environment, we have functionally reconstituted the ATP synthase in giant unilamellar vesicles and tracked the membrane fluctuations by means of flickering spectroscopy. We find that ATP synthase rotates at a frequency of about 20 Hz, promoting large non-equilibrium deformations at discrete hot-spots in lipid vesicles and thus inducing an overall membrane softening. The enhanced non-equilibrium fluctuations are compatible with an accumulation of active proteins at highly curved membrane sites through a curvature-protein coupling mechanism that supports the emergence of collective effects of rotating ATP synthases in lipid membranes.

Foto: attached

short CV: ILM completed his B.Sc. in Condensed Matter Physics at Universidad Autónoma de Madrid (UAM) in 2001. Supervised by Prof Philippe F. Devaux at Institut de Biologie Physico-Chimique (CNRS) and Marisela Vélez (UAM); his PhD thesis (2006, Université Paris 7) focused on lipid asymmetry, the flip-flop of ceramides as well as the biological implications of the enzymatic conversion of sphingomyelin into ceramide. He joined the group of Prof. Francisco Monroy at the Universidad Complutense de Madrid (UCM) with a reintegration fellow from the Spanish Ministry of Science. During this time, his research efforts focused on the mechanics of model lipid membranes under the action of different proteins involved in biological processes such as apoptosis or bacterial cell division. In 2013, ILM was awarded with a Starting Grant from the European Research Council to go deep into the fabrication of membrane-based bioinspired artificial systems to improve the treatments currently available for mitochondrial diseases. From 2014, he leads the Mitochondrial Membranes Lab at UCM and Hospital 12 de Octubre.