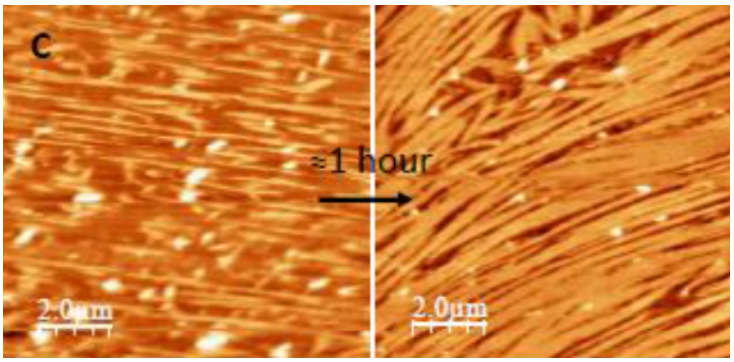
Dissipative self assembly of FtsZ over lipid bilayers.

The project is framed within a financed project (PID2021-125024NB-C21) dedicated to study dissipative self-assembly of active proteins on lipid bilayers. The team is constituted by groups from la Universidad Complutense and from different CSIC centers (Instituto de Catálisis y Petroleoquímica, ICP, Centro Nacional de Biotecnología, CNB, e Instituto de Qiịuímica Física Rocasolano) . The active protein of interest is FtsZ, a bacterial cytoskeletal protein, a globular, soluble GTP binding protein that is essential for bacterial cell division. Upon GTP hydrolisis it assembles into linear dynamic filaments that can organize in higher order structures (Mingorance et al., 2010). There is experimental evidence that when the filaments are associated to a lipid bilayer they display a highly dynamic and complex behaviour (Loose and Mitchison, 2013)(Ramirez-Diaz et al., 2021). The details of how GTP consumption and confinement in a two dimensional fluid surface regulate the dynamic behaviour (Vélez, 2022).



The project aims at understanding how GTP consumption affects the plasticity and adaptability of the filaments on a surface that presents spatial obstacles. The project consists in preparing micro structured surfaces and studying the distribution and dynamics of the filaments using atomic force microscopy (AFM) in the presence of GTP, hydrolizable nucleotide that renders the filaments active, and in the presence of GPcPP, a non hydrolizable nucleótido that allows the formation of static filaments. The characterization will also include using fluorescence microscopy to look at the bilayers and the protein filaments, previously labelled with fluorescence tags.

The student will learn how to use the AFM, how to prepare liposomes to create supported and patterned supported lipid bilayers, fluorescence techniques, and will work in a highly interdisciplinary atmosphere in collaboration with various research groups, both experimental and theoretical, belonging to different institutions.

The work will be executed mainly in the Instituto de Catálisis y Petroleoquímica, CSIC, located in the Campus de Excelencia de la UAM, in the lab of Dr. Marisela Vélez https://icp.csic.es/profile/velez-tirado-marisela/

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