

## Supervisor Expression of Interest MSCA-IF Marie Skłodowska Curie Action-Individual Fellowship 2020

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<b>Research Topic:</b>	Synthetic molecular receptors in liposomes
<b>Brief description of the research project idea:</b>	
<p><b>Synthetic molecular receptors in liposomes</b></p> <p>The interesting properties of liposomes, such as their biocompatibility, biodegradability, and ability to trap both hydrophilic and lipophilic species have boosted their application in therapeutics, clinical diagnosis and cosmetic or food industry, among others. Supramolecular chemists and biologists have also used liposomes as model cell membranes to study the transport mechanism of natural proteins or the efficacy of synthetic transporters.</p> <p>The overarching aim of the project is to combine the specificity, reversibility and tunability of synthetic molecular receptors with the versatility and compartmentalization ability of liposomes to develop new tools in the area of sensing, therapeutics and catalysis.</p> <p>We will mainly use aryl-extended calix[4]pyrroles as synthetic carriers and molecular receptors. They will be inserted either within the liposomal membrane or in the internal aqueous space. Specifically we will focus on (i) the design and synthesis of a series of aryl-extended calix[4]pyrrole receptors featuring dissimilar solubilities in organic and aqueous solution and displaying high selectivity toward biorelevant guests (e.g. anions, amino acids, creatinine, neurotransmitters); (ii) the study of the transport properties of the prepared receptors (i.e. carriers) for anions and amino acids through liposomal membranes; (iii) the use of fluorescent calix[4]pyrroles carriers for the characterization of its distribution within the liposomal membrane and the study of the transport mechanisms; (iv) the use of water-soluble fluorescent receptors for the selective recognition of biologically relevant guest (i.e. amino acids, creatinine) inside the liposome's internal aqueous space. Achieving this goal will expand the currently limited fluorescent methods for the assessment of the transmembrane transport activity of synthetic and natural transporters. Finally (v) the inclusion of molecular containers or open-end receptors based on calix[4]pyrroles in the interior aqueous phase of liposomes will enable the study of their properties as molecular reactors to mediate uni- and bimolecular reactions and modify the reaction outcome compared to the bulk solution. The properties of the best carriers, sensors and reactors will also be investigated using HeLa human cells in collaboration with biological groups in Barcelona.</p> <p>Prof. Ballester is completely open to alternative project proposals related to the use of supramolecular synthetic receptors in the area of molecular recognition, sensing and catalysis. Ambitious project proposals from highly talented and motivated post-doctoral researchers with strong background in supramolecular chemistry will be appreciated.</p>	