O-05.5 Short talk

Sprouting vesicles and far-reaching nanotubes: a journey to lipid networks

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Lipid membranes are ubiquitous in biology; indeed, it is not surprising that they have evolved to serve diverse functions, such as organization, transport, and signaling to cite a few examples. Inspired by the bacterium S. oneidensis, we aim to develop yet an additional use for them: a matrix facilitating transport across a network. To accomplish this, we utilize giant unilamellar vesicles (GUVs), micrometric lipid membranes well suited for this purpose: they are easy to observe using confocal microscopy, highly responsive to environmental cues, and susceptible to deformation. We exploit these properties to induce nanotube formation through calcium asymmetry, osmotic gradients, and microfluidics. Our second goal is to fuse these projected nanotubes with neighboring GUVs via calcium-mediated fusion, thus establishing controlled connection between edges (nanotubes) and nodes (GUVs). We find that the use of calcium to both induce tubulation and nanotube-GUV fusion, all the while preventing GUVs from clustering together, is a delicate balancing challenge, requiring the careful control of vesicle concentration, calcium addition, and lipid composition.