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The Auditorium (Level 1)

From wetting to complex remodeling and damage stabilization: the cross-talk between biomolecular condensates and membranes

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Dr Mangiarotti is an experimental biophysicist with more than 10 years of research and teaching experience. His research interests lie in understanding the interplay between membranes and biomolecular condensates. Dr Mangiarotti combines advanced microscopy techniques with spectroscopy to study the interaction mechanisms at different scales: the ultimate goal is to be able to tune these interactions in cells.

Recent research highlights a crucial interaction between biomolecular condensates and membrane-bound organelles, impacting both cell physiology and disease. Using model systems, we demonstrated that condensates in contact with membranes can undergo wetting transitions, promoting a mutual remodeling process. In cells, we uncovered a new mechanism by which condensates can stabilize damaged lysosomes, allowing their repair.

Using nano-environmental sensors and advanced microscopy techniques allowed us to explore the interaction at the molecular scale: by analyzing the condensates' internal protein structure and their response to the environment, we correlated the behavior at the molecular scale with the resulting material properties. Moreover, we discovered a mechanism by which condensates locally modulate lipid packing and hydration.

Altogether, these findings hold significant implications for understanding organelle formation and remodeling, and how cells can modulate their membrane properties, potentially paving the way for the development of new therapies by manipulating these cellular processes.

3 Recent Publications:

1. Mangiarotti, A.*, Siri, M., Tam, N.W. *et al.* Biomolecular condensates modulate membrane lipid packing and hydration. *Nature Communications* **14**, 6081 (2023). https://doi.org/10.1038/s41467-023-41709-5
2. Mangiarotti, A., Chen, N., Zhao, Z. *et al.* Wetting and complex remodeling of membranes by biomolecular condensates. *Nature Communications* **14**, 2809 (2023). https://doi.org/10.1038/s41467-023-37955-2
3. Bussi, C.*, Mangiarotti, A., Vanhille-Campos, C. *et al.* Stress granules plug and stabilize damaged endolysosomal membranes. *Nature* **623**, 1062–1069 (2023). https://doi.org/10.1038/s41467-023-41709-5