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Phospholipids and other amphiphilic molecules organic, evolutionary and plausible prebiotic synthesis and use in system chemistry.

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Nucleic acids, phospholipids and other organic phosphates have a central role in biological pathways.

It is still uncertain how the first minimal cellular systems evolved to the complexity required for life to begin, but it is obvious that the role of amphiphilic compounds in the origin of life is one of huge relevance while they form giant vesicles that resemble compartments of biological cells, mimicking them in their dimension, membrane structure and partly in their membrane composition. The spontaneous appearance of closed membranes composed of bilayers of self-assembling amphiphiles was likely a prerequisite for Darwinian competitive behavior to set in at the molecular level. Such compartments should be dynamic in their membrane composition (evolvable), sufficiently stable to harbor macromolecules (leak-free), yet semi-permeable for reactive small molecules to get across the membrane (stay away from chemical equilibrium). The aim of this seminar is to summarize the most relevant progresses made in the field of these molecules synthesis under plausible prebiotic conditions. Furthermore we will present our recent discoveries on their role in the polymerization of peptides and nucleotides under plausible prebiotic conditions and in addition we will present a short overview of their use for the preparation of supported glass giant vesicles as proto-cell models and to show a recent techniques set up in our research laboratory for the separation and purification of phospholipidic giant vesicles. This novel methodology is briefly discussed as a future tool for selection experiments on GV populations.

The synthesis of mono-alkyl phosphates and their derivatives: an overview of their nature, preparation and use, including synthesis under plausible prebiotic conditions

Fiore, *M Org. Biomol. Chem.*, **2018**, 16, 3068

Rapid purification of giant lipid vesicles by microfiltration. Fayolle et al., *PLoS ONE* **2018**, 13: e0192975;
[DOI:10.1371/journal.pone.0192975](https://doi.org/10.1371/journal.pone.0192975)

Glass Microsphere-Supported Giant Vesicles as Tools for Observation of Self-reproduction of Lipid Boundaries. Fiore et al., *Angew. Chem. Int. Ed.* **2018**, 57, 282;

Crude phosphorylation mixtures containing racemic lipid amphiphiles self-assemble to give stable primitive compartments.

Fayolle et al., *Sci. Rep.* **2017**, 7, 18106;

Giant vesicles from rehydrated crude mixtures containing unexpected mixtures of amphiphiles formed under plausibly prebiotic conditions.

Fiore et al., *Org. Biomol. Chem.* **2017**, 15, 4231;

Bringing Prebiotic Nucleosides and Nucleotides Down to Earth.

Fiore & Strazewski, *Angew. Chem. Int. Ed.* **2016**, 55, 13930;

Prebiotic Lipidic Amphiphiles and Condensing Agents on the Early Earth

Fiore & Strazewski, *Life*, **2016**, 6, 17;