Modeling chiral polymers
Modélisation de polymères chiraux

Proposition de stage / Internship offer

Biological polymers are dynamical objects, usually assembling to form 3D (bulk), 2D (surface) or 1D (filamentous) structures. In addition to their dynamical properties, they are often polar and chiral. This chirality likely plays a role in the mechanical behaviour of supra-molecular assemblies. This internship aims at understanding how the response of such assemblies depend on the polymer chirality.

The project The student will extend an existing simulation framework to implement chiral polymer (actin filaments). The behavior of individual filaments will be compared to analytical results. The implementation will then be used to simulate assemblies of such filaments, that cannot easily be addressed analytically, and compared to non-chiral filaments.

Methods The student is expected to develop an understanding of the theoretical mechanics of chiral filaments in 3D. Programming skills will be necessary to develop the implementation.

The lab The team "Cellular Spatial Organization" is an interdisciplinary team that hosts both theoreticians and experimentalists, and has gained a reputation on intracellular architecture and mechanics. We develop cutting-edge methods both experimental and theoretical. It is in an ideal scientific environment for a biophysicist, being located in a biology institute with a strong focus on experimental biophysics, and neighbor to an experimental and theoretical physics institute. It is also conveniently located inside Paris at the intersection of several public transport networks.

Supervision The student will be mentored by Serge Dmitrieff : `serge.dmitrieff@ijm.fr`.
More information :

- `www.biophysics.fr`
- `https://github.com/SergeDmi`
- `https://twitter.com/bio_physics`

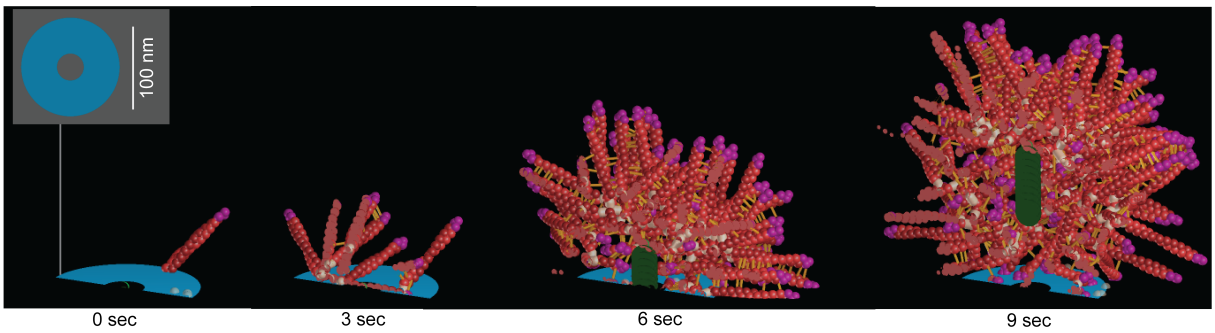

Figure 1: Overdamped Langevin simulation of actin filaments in yeast endocytosis. Actin filaments (red) polymerize at the nucleation disc (blue). Since actin is tethered to the vesicle (green), the polymerization of new filaments will pull the vesicle upwards. (+) ends of actin filaments are shown in purple.