



## Seminar/Talk

# Controlling the shape of colloid clusters, and colloid navigation

**Olivier Pierre-Louis**

CNRS, ILM-Lyon

Host: Carl Goodrich

We have investigated theoretically how one can manipulate the shape of a small cluster of colloids (or nano-particles) using a macroscopic external field in the presence of thermal fluctuations [1,2,3]. This problem can be formulated as a minimization of first passage times in configuration space. We obtain the optimal policy to reach an arbitrary target configuration using Dynamic Programming. We then show how the efficiency of Reinforcement-Learning vanishes at the nanoscale due to thermal fluctuations [4]. We have also applied a similar approach to the navigation of a single colloid. We have determined the changes in the optimal policy in the presence of frozen disorder [5]. Surprisingly, strong changes in the optimal navigation policy are found for disorder with low densities of defects. References: [1] F Boccardo, O Pierre-Louis Physical Review Letters 128, 256102 (2022); [2] F Boccardo, Y Benamara, O Pierre-Louis Physical Review E 106, 024120 (2022); [3] F Boccardo, O Pierre-Louis Journal of Statistical Mechanics(10), 103205 (2022) [4] F Boccardo, O Pierre-Louis Phys. Rev. E 110, L023301 (2024); [5] K Bilai Biloa and O Pierre-Louis, preprint (2025).

**Thursday, June 12, 2025 10:00am - 11:00am**

Office Bldg West / Ground floor / Heinzl Seminar Room (I21.EG.101)



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