

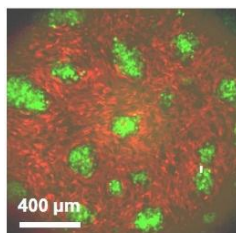
M2/PhD project

Laboratoire Physique des Cellules et Cancer
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Team: Biology-inspired Physics at MesoScales (https://institut-curie.org/teams/buguin_silberzan)

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Impact of self-organized elongated fibroblasts in the sorting of cancer cells



Even though the presence of cancer-associated fibroblasts (CAFs) in the vicinity of tumors is well documented, it is not clear whether they promote or inhibit the escape and migration of the cancer cells away from the primary tumor. Both functions can even be sequentially fulfilled at different stages and grades of the tumor.

In vivo experiments monitoring the morphology of tumors in mice are very valuable, but are too complex to infer a physical mechanism. Here, we propose an interdisciplinary experimental program that aims at investigating the processes involved in cocultures of CAFs and tumor cells (TCs). Experiments will initially be performed on Ewing tumor cells, an aggressive cancer targeting teenagers and young adults. In a second step, breast cancer cells will also be studied. Sorting of the CAFs and TCs is dictated not only by the cell/cell adhesive properties and rheology, as would be the case for passive materials, but also by the CAFs' "nematic" organization (their propensity to align along a common direction) and their active contractility, both properties potentially affecting the tumor's structure.

In close collaboration with O. Delattre's and F. Mechta-Grigoriou's labs, we will use cell lines whose adhesion and invasiveness properties can be controlled. The environment of the cells on the surface will be tailored and controlled by microfabrication techniques. The observations will be interpreted with physical theories encompassing adhesion and active nematicity. These well-controlled in vitro experiments may bring new insights into the mechanisms directing the evolution of these cancer systems in their in-vivo native environment.

Recent references of the group (selection)

- Lacroix M et al.: *Emergence of bidirectional cell laning from collective contact guidance*. Nature Physics **20**, (2024) 1324
- Sarkar T. et al.: *Crisscross multilayering of cell sheets*, PNAS Nexus, **2**, (2023), pgad034
- Yashunsky V et al : *Chiral Edge Currents in Nematic Cell Monolayers* Physical Review X **12**, (2022), 041017.