PhD Position: Mechanochemical control of tumor heterogeneity in colorectal cancer

Tumor mechanobiology - phenotypic plasticity - tissue self-organization - quantitative imaging - traction force microscopy

The group

The **"Tumor Dynamics and Plasticity"** group is a newly established research team at **Institut Gustave Roussy (Paris)**, led by Carlos Pérez-González. Our goal is to understand how mechanochemical signals regulate tumor cell state patterning and how these processes drive tumor progression and clinical outcome.

We are building a multidisciplinary team at the interface of biology and physics, integrating mechanobiology, organoids, quantitative imaging, and mouse tumor models. Located within the largest cancer hospital in Europe, our lab benefits from access to patient-derived organoids, clinical samples, and oncology expertise.

Our ambition is to create a supportive, inclusive, and stimulating research environment where scientific curiosity thrives. We value collaboration, intellectual rigor, and creativity, and we are committed to fostering a positive atmosphere in which team members can grow scientifically and personally.

The project

Tumor phenotypic heterogeneity and plasticity drive metastasis, therapy resistance, and relapse. While current models attribute these features to genetic alterations and microenvironmental cues, our recent findings reveal that heterogeneity can also emerge through mechanochemical communication among cancer cells (Pérez-González et al. Biorxiv 2025). These results identify self-organization as a previously unrecognized regulator of tumor heterogeneity.

In this project, we will integrate bioengineering, force measurements, quantitative imaging, and transcriptomics in patient-derived organoids and tumors to dissect the intrinsic mechanochemical programs that shape colorectal cancer heterogeneity. Using this strategy, we will identify novel biochemical and mechanical cues regulating colorectal tumor growth, invasion, and metastasis.

Expected skills

We are seeking a highly motivated candidate excited to perform a PhD in a collaborative and multidisciplinary environment. The applicant should have a strong interest in quantitative biology, mechanobiology, and cancer.

While not mandatory, prior experience in one or more of the following areas will be considered an asset: programming skills (MATLAB or Python), bioengineering, organoid culture, live-cell imaging and mouse tumor models.