European School of Molecular Medicine

2025 summer call PhD selections

AVAILABLE POSITIONS

Principal Investigator	Nils Gauthier
Affiliation	IFOM ETS - the AIRC Institute of Molecular Oncology
Title of the proposed project:	Intra-patient diversity in Glioblastoma
Short description of the project	Glioblastoma (GBM) tumors are highly aggressive and debilitating primary brain tumors that lead to the destruction of the brain and the rapid death of patients (14 months from detection). To this day, GBMs remain incurable, even with aggressive treatments that include brain surgery, radio- and chemo-therapies. The Goal of this phD is to study the mechanoproperties and the motility modes of glioma cells isolated from patients with engineered tools that mimic the surface of the brain blood vessels (2). We have shown that GBM motility modes and mechanoproperties are highly heterogeneous by comparing clones isolated from different patients, highlighting the existence of inter-patient heterogeneity at phenotypic levels (1,3). We found that molecules controlling cell mechanoproperties, such as the formins FMN1 or FHOD3, are implicated in invasion (1,3). While inter-patient heterogeneity is clear, high intra-patient heterogeneity has been reported in several transcriptional and genomic studies. In our preliminary results, this intra-patient heterogeneity appears also at phenotypic (motility, mechanical properties…) and molecular level (RNA sequencing, protein content…). The candidate during the phD will identify, classify, and analyze the various motility modes present in clonal populations from single patients. Each motility mode will be tagged with a mechanical signature (stiffness, response to forces, capacity to generate forces…) and correlated with molecular signatures. This will define the mechanobiology landscape of GBMs and highlight the most dangerous subpopulations of cells. The candidate will also study the role of known and newly discovered molecular players in these migration modes and mechanoproperties. Ultimately, we hope that this work with its original angle will allow the identification of unexpected therapeutic axis to stop these tumors from invading and transform them into focal tumors easier to treat. Key publications from the lab linked to this project: 1) Biomimetic Approach of Brain Vasculature Rapidly Characterizes Inter-and Intra-Patient Migratory Diversity of Glioblastoma. M Crestani, Small Methods 2024 2) Emergent seesaw oscillations during cellular directional decision-making. JE Ron, Nature Physics 2024 3) Adaptive mechanoproperties mediated by the formin FMN1 characterize glioblastoma fitness for invasion P Monzo, Developmental cell 2021
Main research area for the project	Cancer Biology
Second research area for the project	Molecular and cellular biology

European School of Molecular Medicine

2025 summer call PhD selections

AVAILABLE POSITIONS

3 key words for project	Glioblastoma, Cell Biology, Patient-derived organoids
Main topic/s of the lab	Mechano-Oncology
Short description of the lab activity	The Mechano-Oncology unit at IFOM, Nils Gauthier's lab. Nils Gauthier Joined IFOM in January 2016 to start a research group focused on Mechano-Oncology using interdisciplinary approaches to study the biophysical properties of tumor progression. The lab is focus essentially on the implication of a key biomechanical interface in tumor-associated biological processes: the membrane-cytoskeleton interaction (i.e. the interaction between the lipid-based plasma membrane of the cell with the protein-based cytoskeleton of the cell). This will be tackle at 3 levels: A) Supporting tissues (stroma) with the study of fibrobast-matrix interaction. B) Immune function with the study of macrophage biomechanics. C) Brain cancer progression with the study of glioblastoma invasive properties.
Recent bibliography	**1.**Biomimetic Approach of Brain Vasculature Rapidly Characterizes Inter-and Intra-Patient Migratory Diversity of Glioblastoma M Crestani, N Kakogiannos, S Iori, F Iannelli, T Dini, C Maderna, Small Methods 8 (12), 2024 **2.**Emergent seesaw oscillations during cellular directional decision-making JE Ron, M Crestani, JM Kux, J Liu, N Al-Dam, P Monzo, NC Gauthier, ... Nature Physics 20 (3), 501-511 2024 **3.**Mechanically induced topological transition of spectrin regulates its distribution in the mammalian cell cortex A Ghisleni, M Bonilla-Quintana, M Crestani, Z Lavagnino, C Galli, Nature Communications 15 (1), 2024 **4.**Mechanotransduction through membrane tension: It's all about propagation? A Ghisleni, NC Gauthier Current Opinion in Cell Biology 86, 2022 5.Adaptive mechanoproperties mediated by the formin FMN1 characterize glioblastoma fitness for invasion P Monzo, M Crestani, YK Chong, A Ghisleni, K Hennig, Q Li, ... Developmental cell 56 (20), 2841-2855. 2021 google scholar page for full publication track: https://scholar.google.com/citations?user=dW-nNhMAAAAJ&hl=en
Group composition	We are 5. 2 permanent senior scientists, 2 PhD student, 1 Post doctoral scientist
Institutional page link	https://www.ifom.eu/en/
Lab website link	https://www.ifom.eu/en/cancer-research/researchers/nils-gauthier.php