RESEARCH ACTIVITY SHEET

2025 PhD selections

YOUR DETAILS

* Name & Surname: Marco Cosentino Lagomarsino

* Affiliation IFOM

PHD PROJECT DETAILS

* Title of the proposed project

Single-cell dynamics and cancer persistence

* Short description of the project (up to 300 words)

Our group invites applications for a PhD position bridging cell biology with our expertise in advanced data analysis, mathematical modeling and quantitative biology to address fundamental questions relevant to cancer treatment.

Cancer persistence refers to a reversible state where cancer cells temporarily halt their growth and stop cycling, allowing them to survive treatment and later resume proliferation, which contributes to therapy resistance and tumor relapse. The project will explore the reversibility of G0 and G1 cell cycle arrests in cancer and non-cancer cell lines using state-of-the-art advanced microscopy and single-cell tracking techniques. The goal is to quantify cellular arrest and reawakening dynamics and investigate regulatory, physiological and biophysical variables that affect them.

The PhD candidate will benefit from our collaborations with the Piel lab (Curie Institute, Paris) and the Mazza lab (San Raffaele, Milan), gaining specialized training on innovative experimental approaches. The candidate will also work closely with our group's experts in mathematical modeling and advanced data analysis, providing a unique opportunity to generate predictive and mechanistic insights.

We seek an outstanding and motivated candidate with a strong background in cell biology and practical experience in microscopy. This interdisciplinary project requires a daring and collaborative researcher, enthusiastic about interdisciplinary research and eager to work across fields and in an international collaboration network. No prior coding, data analysis, or modeling skills are strictly required, but the candidate should be willing to learn basic data analysis tools—such as plotting and using Python scripts developed by the group—to effectively communicate and collaborate with team members.

Applicants from (bio)physics, (bio)engineering, or related areas are also welcome, provided they have hands-on wet-lab experience with mammalian cells and microscopy techniques.

* Indicate the main research area for the project described above Molecular Biology

If needed indicate a second research area for the project described above Computational biology

* Provide up to 3 key words for project:

Cancer persistence, single-cell dynamics, advanced microscopy & quantitative biology

YOUR LABORATORY ACTIVITIES DETAILS

* Main topic/s of the lab

Cell growth, cell cycle progression, phenotypic strategies, evolution and resistance

* Short description of the lab activity (up to 500 words)

The theoretical and computational group "Statistical Physics of Cells and Genomes" specializes in a theoretical approach to living systems based on modeling and data-analysis tools from theoretical physics, with a strong track record of biological applications and experimental collaborations. Our approach can be described as "model-driven data science," employs simple yet falsifiable mathematical models to identify and interpret complex biological behaviors, validated through quantitative data analysis from, published sources, symbiotic experimental partnerships, and more recently in-house experiments. Currently, the group focuses on developing quantitative models of cellular growth and cell-cycle progression, particularly to predict tumor cell behavior and responses to growth-inhibiting therapies. A key research interest is the phenomenon of "persistence," where dormant tumor cell subpopulations survive lethal drug doses, causing cancer relapse after remission. We aim to provide physiological explanations for persistence and create predictive models that could inform future clinical strategies.

* Recent bibliography (max 5 references)

Nishit Srivastava, Ludovico Calabrese, Camille N. Plancke, Romain Rollin, Larisa Venkova, Kristina Havas,Marco Cosentino Lagomarsino, Matthieu Piel *A Dual Homeostatic Regulation of Dry Mass and Volume Defines a Target Density in Proliferating Mammalian Cells* bioRxiv 2025.04.24.650395 2025

L Calabrese, L Ciandrini, M Cosentino Lagomarsino *How total mRNA influences cell growth* Proceedings ofthe National Academy of Sciences USA 121(21):e2400679121 2024

FA Pennacchio, A Poli, FM Pramotton, S Lavore, I Rancati, M Cinquanta, D Vorselen, E Prina, OM Romano,A Ferrari, M Piel, M Cosentino Lagomarsino, P Maiuri *N2FXm, a method for joint nuclear and cytoplasmic volume measurements, unravels the osmo-mechanical regulation of nuclear volume in mammalian cells* Nat Commun 15, 1070 2024

Viola Introini, Gururaj Rao Kidiyoor, Giancarlo Porcella, Pietro Cicuta, Marco Cosentino Lagomarsino *Centripetal nuclear shape fluctuations associate with chromatin condensation in early prophase*. CommunBiol 6, 715 2023

Clotilde Cadart, Matthieu Piel, Marco Cosentino Lagomarsino *Volume growth in animal cells is cell cycledependent and shows additive fluctuations* eLife, 11, e70816 2022

* Group composition: total members, and roles distribution (PhD, postdoc, technician, etc.)

Marco Cosentino Lagomarsino | PI |

Simone Pompei | Senior Scientist | Evolution and phenotypic strategies

Rossana Droghetti | PhD | Cell growth

Mattia Corigliano | PhD | Cell cycle and persistence

Giorgio Tallarico | PhD | Cell growth

Valentina Guarino | PhD | Cell cycle arrests, phenotypic stragies, evolution

Andrea Ripamonti | PhD | Cell growth, maintenance and proteostasis

Alessia Sanbruna | Student | Cell growth

Institutional page link

https://www.ifom.eu

Lab website link, if any

http://spcg.unimi.it/

Social media links, if any

https://bsky.app/profile/spcggroup.bsky.social

If you prepare a video to promote your lab/project, please include the link below