



EDUCATION AND TRAINING

11/2023 – CURRENT Roma, Italy

PHD IN PHYSICS La Sapienza, Università di Roma

I am working on the study of the proliferation of a tumour cell line in an attempt to determine the dynamics of growth and division and to identify the size control mechanism adopted by the cells and how it changes under varying growth conditions.

To do this, in addition to using an experimental protocol based on flow cytometry measurements, I am working on developing a microfluidic device for a single-cell study

Field of study Physics

2020 – 2022 Roma, Italy

MASTER DEGREE IN PHYSICS Sapienza Università di Roma

During my master's studies, I acquired a good knowledge of several topics in biophysics.

I have acquired a solid background in the theoretical foundations of the physics of biological systems and the most important experimental techniques of biophysics and soft matter. I have also attended courses in Molecular Biology, Biochemistry and Medical Applications of Physics. All courses were held in English

Field of study Physics | **Final grade** 110/110 cum Laude |

Thesis Measuring the cancer cell growth dynamics in different environmental conditions

2016 – 2020 Roma, Italy

BACHELOR DEGREE Sapienza Università di Roma

During my studies, I acquired detailed knowledge of classical and modern physics both from theoretical and experimental points of view.

Field of study Physics | **Final grade** 98/110 |

Thesis IORT (Intra-Operative Radiation Therapy): Effetti delle radiazioni ionizzanti ed efficacia biologica

2011 – 2016 Roma, Italy

HIGH SCHOOL DEGREE IIS Liceo Evangelista Torricelli, Roma

Final grade 100/100

WORK EXPERIENCE

RESEARCH FELLOWSHIP – CENTER FOR LIFE NANO- & NEURO-SCIENCE, ISTITUTO ITALIANO DI TECNOLOGIA –

11/2024 – Current – ROMA, ITALY

Research Fellowship focused on the development of a home-made microfluidic device for monitoring the division dynamics of single cancer cells trapped in microchannels during time-lapse microscopy experiments. This approach enables long-term tracking of the progeny from a single proliferative event and the assessment of morphological changes in individual cells after division. The ultimate goal of this project is to obtain detailed information on the proliferation dynamics of single cancer cells and their progeny, while also evaluating morphological variations through the implementation of a dedicated microfluidic and time-lapse imaging protocol.

Merit-based fellowship.

JUNIOR RESEARCH SCHOLARSHIP – DEPARTMENT OF PHYSICS, LA SAPIENZA, UNIVERSITÀ DI ROMA – 12/2023 –

10/2024 – ROMA, ITALY

Winner of a merit-based Junior scholarship with the Department of Physics during which I worked on a research project titled "Development of microfluidic systems to measure partitioning noise in tumour cells".

Winner of a merit-based Junior scholarship with the Department of Physics during which I worked on a research project titled "Study of Interactions among Biomolecules Involved in Cell Growth and Division Mechanisms".

SPECIFIC TUTORING FOR OFA REMEDIATION – FACULTY OF MATHEMATICAL, PHYSICAL AND NATURAL SCIENCES, LA SAPIENZA UNIVERSITÀ DI ROMA, ITALY – 11/2022 – 01/2023 – ROMA, ITALY

Winner of a merit-based tutoring scholarship induced by the Faculty of Mathematical, Physical and Natural Sciences at the University of Rome 'La Sapienza'. The grant provided for the preparation of teaching materials and the provision of basic mathematics courses for students with OFA (Added Formative Obligation) debts.

COLLABORATIVE ACTIVITIES WITH THE B. PONTECORVO LABORATORIES – DEPARTMENT OF PHYSICS, LA SAPIENZA, UNIVERSITÀ DI ROMA – 03/2022 – 10/2022 – ROMA, ITALY

Winner of a merit-based collaboration scholarship with the Department of Physics. I worked as a scholarship holder in the B. Pontecorvo laboratories. I assisted the professors in preparing and carrying out laboratory experiments for the first year of the Bachelor in Physics.

PRIVATE TUITION – ROMA, ITALY

While still in university, I started giving private tutoring to middle school, high school and university students. As a result, I was able to gain important experience in tutoring and preparing for academic exams and catching up on school years.

● **PUBLICATIONS**

2024

[A size-dependent division strategy accounts for leukemia cell size heterogeneity](#)

Heterogeneity in the size distribution of cancer cell populations is linked to drug resistance and invasiveness. However, understanding how such heterogeneity arises is still damped by the difficulties of monitoring the proliferation at the typical timescales of mammalian cells. Here, we show how to infer the growth regime and division strategy of leukemia cell populations using live cell fluorescence labeling and flow cytometry in combination with an analytical model where cell growth and division rates depend on powers of the size. We found that the dynamics of the size distribution of Jurkat T-cells is reproduced by (i) a sizer-like division strategy, with (ii) division times following an Erlang distribution and (iii) fluctuations up to ten percent of the inherited fraction of size at division. Overall, our apparatus can be extended to other cell types and environmental conditions allowing for a comprehensive characterization of the growth and division model different cells adopt.

Miotto, Mattia, et al. "A size-dependent division strategy accounts for leukemia cell size heterogeneity." *Communications Physics* 7.1 (2024): 248.

Authors: Miotto, M., Scalise, S., Leonetti, M., Ruocco, G., Peruzzi, G., & Gosti, G | **Publisher:** Communications Physics

2025

[Robust assessment of asymmetric division in colon cancer cells](#)

Asymmetric partition of fate determinants during cell division is a hallmark of cell differentiation. Recent works suggested that such a mechanism is hijacked by cancer cells to increase both their phenotypic heterogeneity and plasticity and in turn their fitness. To quantify fluctuations in the partitioning of cellular elements, imaging-based approaches are used, whose accuracy is limited by the difficulty of detecting cell divisions. Our work addresses this gap proposing a general method based on high-throughput flow cytometry measurements coupled with a theoretical frameworks. We applied our method to a panel of both normal and cancerous human colon cells, showing that different kinds of colon adenocarcinoma cells display very distinct extents of fluctuations in their cytoplasm partition, explained by an asymmetric division of their size. To test the accuracy of our population-level protocol, we directly measure the inherited fractions of cellular elements from extensive time-lapses of live-cell laser scanning microscopy, finding excellent agreement across the cell types. Ultimately, our flow cytometry-based method promise to be accurate and easily applicable to a wide range of biological systems where the quantification of partition fluctuations would help accounting for the observed phenotypic heterogeneity and plasticity.

Caudo, D., Giannattasio, C., Scalise, S., de Turreis, V., Giavazzi, F., Ruocco, G., ... & Miotto, M. (2025). Robust assessment of asymmetric division in colon cancer cells. *eLife*, 14.

● CONFERENCES AND SEMINARS

10/09/2025 – 12/09/2025 Ancona, Italia

Fifth DiSVA-MaSBiC Symposium Advances in Biomolecular Sciences: Perspectives on Structure, Function and Dynamics

Contributed with an oral presentation: "A Microfluidic Device Enabling Single-Cell Analysis of Leukemia T Cell Proliferation"

30/06/2025 – 04/07/2025 Roma, Italia

15th European Biophysics Congress

Presented a poster: "A Mother-Machine Microfluidic device for Leukemia cell"

09/06/2025 – 13/06/2025 Napoli, Italia

Biological Physics and Statistical Mechanics: from molecules to cells and beyond

Contributed with an oral presentation: "A Single-Cell Microfluidic Device for Studying Leukemia Cell Proliferation"

12/11/2024 – 15/11/2024 Seattle, Washington, USA

11th EMT International Association (TEMTIA 11)

Presented a poster: "Determining cancer cells division strategy under starvation"

25/09/2024 – 27/09/2024 Ancona, Italia

Fourth DiSVA-MaSBiC Symposium Advances in Biomolecular Science: Perspectives on Structure, Function and Complexity

Presented a poster: "A size-dependent division strategy accounts for leukemia cell size heterogeneity"

03/06/2024 – 07/06/2024 Trieste, Italia

Annual meeting of the Physics of Living Systems (PoLS) Student Research Network

Contributed with an oral presentation: "Determining cancer cells division strategy"

● SKILLS

Programming

Good knowledge of Python | R, Rstudio | Matlab | Good knowledge of programming languages C/C++ | COMSOL Multiphysics | Inkscape | KLayout | Molecular Dynamics Simulation Software: GROMACS

Digital

Good knowledge of the text editors Overleaf and LaTeX | Mastery of the Office package (Word, Excel, PowerPoint ecc) | Microsoft Office | Windows

Data Analysis

Data management | Statistical analysis | Mathematical models applied to biological systems

Laboratory Techniques

Flow Cytometry | Cell culture | Microfluidics & Microfabrication | Soft Lithography

● LANGUAGE SKILLS

Mother tongue(s): **ITALIAN**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	B1	B2	B1	A2	B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

● OUTREACH

2025

Course Coordinator – “Orientamento Next Generation” Project (PNRR, MUR) - University of Rome “La Sapienza”

Winner of two competitive calls for supporting the delivery of active orientation courses for upper secondary school students, within the national program for the school–university transition. Involved in coordination between the University and partner schools, management of teachers and students on the digital platform, tutoring, lecture management, and organizational/didactic support.

02/2025 – 05/2025

Science Outreach and School Orientation Activities - Center for Life Nano- & Neuro-Science, Istituto Italiano di Tecnologia

Involved in the organization and management of laboratory visits for school classes, from primary to high school. Responsible for coordinating groups of students, presenting the center’s research activities, and delivering hands-on demonstrations and age-adapted scientific explanations to engage students of different educational levels.