PHYSICIAN SCIENTIST
LA MEDICINA INCONTRA LA RICERCA
promosso da: AIRC Fondazione CARIPLO | con il supporto di: SEMM European School of Molecular Medicine | UNIVERSITÀ DEGLI STUDI DI MILANO

2026 Physician Scientist Call

AVAILABLE POSITIONS

Principal Investigator	**MAZZANTI CHIARA MARIA**
Institute of Affiliation	Fondazione Pisana per la Scienza Onlus
Title of the proposed project:	Beyond Pathology: Integrating FLIM and MALDI Imaging for Hidden Ultrastructural Insights in Glioblastoma
Short description of the project	Glioblastoma (GBM) is a highly heterogeneous malignancy where conventional histopathology lacks spatial-functional resolution. This project introduces an innovative translational approach by integrating standard diagnostics with advanced imaging and multi-omics to resolve hidden metabolic and ultrastructural profiles. The research relies on an established pipeline of GBM models (paraffin sections, organotypic slices, tumoroids, cell lines) and an ongoing repository that currently includes over 200 patient-derived vital tumor tissues, which are progressively undergoing comprehensive genomic, transcriptomic, and methylomic characterization. Multimodal imaging will be performed on identical tissue coordinates: mapping spatial metabolism via endogenous NADH lifetime, evaluating chromatin compaction through DAPI lifetime analysis, and acquiring lipidomic profiles via MALDI-imaging. These advanced datasets will be co-registered and overlapped with gold-standard Hematoxylin and Eosin (H&E) staining. This multimodal strategy allows the identification of deeper layers of information invisible to standard methodologies; by integrating these parameters with existing oncological data, it is possible to enrich the insights extracted from a single tissue section, which fundamentally represents a spatial snapshot of the tumor during its temporal progression. Within this framework, since the omics profiling is currently ongoing, the PhD candidate will actively participate in and learn these high-throughput technologies, gaining comprehensive research experience spanning genomics, biophotonics, MALDI imaging, and machine learning. Concurrently, the student's background in brain tumor anatomy will be highly complementary to the laboratory's workflows, specifically aiding in the evaluation and structural recognition of patient-derived vital tissues. The candidate will guide data integration by annotating histopathological features on H&E slides, ensuring that physical, metabolic, and lipidomic readouts are correctly mapped onto classical microscopic structures and tumor niches. This approach holds significant potential to refine conventional pathology and identify novel approaches for patient stratification. The ideal candidate is a medical doctor trained in Neuropathology or Anatomical Pathology eager to embrace digital pathology, genomics, biophotonics, and machine learning.
Main research area for the project	Cancer biology
5 keywords for the project	Glioma and/or glioblastoma – Genomics - Patient risk stratification - Fluorescence imaging system - Machine learning

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LAB INFO	
Main topic/s of the lab	Glioblastoma research
Short description of the lab activity	The Genomics and Transcriptomics Section operates within a cutting-edge research environment at FPS, fully equipped with advanced technological platforms. The laboratory features a specialized microscopy center for Fluorescence Lifetime Imaging Microscopy (FLIM), single-cell isolation systems, laser microdissection, an advanced cell culture facility, and in-house genomics, proteomics, and bioinformatics hubs. Armed with long-standing expertise in glioblastoma research, research activities focus on preclinical model development through a low-manipulation protocol to generate patient-derived 3D glioblastoma explants (GB-EXPs) for drug-combination screening. To decode complex cellular communication, tumor behavioral studies are performed using single-cellular live imaging analysis to investigate how specific cell motility strategies impact glioblastoma prognosis. Furthermore, unsupervised FLIM optical signatures (endogenous NADH and DAPI lifetimes) are integrated with artificial intelligence and spatial multi-omics to uncover hidden tumor-microenvironment interactions and novel prognostic layers. This research is fundamentally rooted in translational medicine; leveraging the platform CellHit, machine learning is applied to transcriptomic data to predict patient-specific drug sensitivities and drive innovative drug repositioning. Building upon this oncological experience, a research line dedicated to osteosarcoma was also recently launched, which is consistently backed by a local donors' association. In both glioblastoma and osteosarcoma frameworks, a focus is dedicated to liquid biopsy applications, specifically isolating and molecularly characterizing circulating tumor cells (CTCs) to track tumor evolution and treatment response. A strong asset of the laboratory remains the exclusive collaboration with the Neuro-Oncology center at the Livorno Hospital, directed by Neurosurgeon Dr. Orazio Santonocito and Neuro-oncologist Dr. Anna Luisa Di Stefano, providing a clinically and omically annotated collection of over 200 patient samples. The research span is extended through key national partnerships with the Istituto Oncologico Veneto (IOV), the Institute of Neuroscience in Bologna, the IRCCS Istituto Romagnolo per lo Studio dei Tumori, Bocconi University, the University of Salerno, Naples, and the Besta Institution. Internationally, engagement is maintained in the multi-center OPTIMUM European clinical trial with Prof. Marc Sanson from Sorbonne University/Hôpital Pitié-Salpêtrière in Paris, alongside collaborations with Dr. James Nicholson at Queen Mary University of London and physicists at the University of North Texas. Collaborations are also established with the Perelman School of Medicine at the

	University of Pennsylvania, specifically with neuropathologist Dr. Nasrallah MacLean and computational scientist Dr. Christos Davatzikos. The section is directed by Dr. Chiara Maria Mazzanti, an expert in cancer genomics with extensive international training, including years spent as a post-doc at Cancer Research UK in London and as a guest researcher at the National Cancer Institute (NCI/NIH) in Bethesda, USA. After managing the Molecular Pathology Diagnostics Laboratory at the University Hospital of Pisa, she founded the Genomics Section at FPS from scratch in 2013. As Principal Investigator of the active AIRC IG 2024 grant, her vision centers on pushing the boundaries of neuro-oncology through advanced imaging and personalized medicine. Within this vibrant, multidisciplinary environment, the selected candidate will find the ideal place to truly flourish as a physician-scientist.
Recent bibliography	Metabolic-imaging of human glioblastoma live tumors: A new precision-medicine approach to predict tumor treatment response early. Front Oncol 2022; 12: 969812 Exploring Regorafenib Responsiveness and Uncovering Molecular Mechanisms in Recurrent Glioblastoma Tumors through Longitudinal In Vitro Sampling. CELLS-BASEL 2024 Mar; 13: Learning and actioning general principles of cancer cell drug sensitivity. NAT COMMUN 2025 Feb; 16: 1654 BIRC3/CAV1 co-expression drives GBM aggressiveness as a prognostic signature and therapeutic vulnerability. CELL DEATH DISCOV 2026 Apr; 12: Prognostic impact of circulating vitamin D and genetic variants in the vitamin D pathway in glioblastoma. Neuro-Oncology Adv 2026; 8: vdag158
Group composition	The laboratory boasts a highly multidisciplinary and translational team comprising 10 members, perfectly structured to support the integration of advanced imaging, multi-omics, and artificial intelligence. The core of the laboratory is led by 3 Senior Researchers, all holding a PhD in Experimental Oncology and possessing profound expertise in molecular biology, genomics, and transcriptomics. Within our active AIRC Investigator Grant (IG) framework, their roles are highly specialized and strategically divided to cover the project's milestones: one senior researcher leads the MALDI-imaging lipidomic workflow, the second directs the FLIM (Fluorescence Lifetime Imaging Microscopy) biophotonics line, and the third manages the bulk omics and single-cell analysis pipelines. The team also includes 5 PhD Students coming from top-tier academic institutions, ensuring an exceptional cross-contamination of skills. Among them are 2 PhD students from the Scuola Superiore Sant'Anna, one of whom is a Medical Doctor specializing in pediatric onco-hematology, serving as a critical bridge between the bench and clinical insights for our pediatric osteosarcoma patients. The doctoral team is further enriched by 1 PhD student from the Scuola Normale Superiore, bringing high-level analytical and scientific standards, 1 PhD student from the University of Pisa (UniPi) focusing on the biological and molecular dynamics of

	tumor models, and 1 PhD student from the National PhD Program in Artificial Intelligence dedicated to computational modeling, data integration, and machine learning pipelines for our CellHit platform. Finally, the laboratory actively invests in training the next generation of scientists, currently hosting 2 Undergraduate Students who will complete their Master's theses in Biology next year. This diverse composition combines clinical, biological, and computational expertise, offering an optimal, high-level environment to mentor an incoming AIRC physician-scientist.
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