POLITECNICO DI MILANO

PhD in BIOINGEGNERIA / BIOENGINEERING - 41st cycle

THEMATIC Research Field: AN ORGANISM-ON-CHIP PLATFORM TO MODEL BREAST CANCER PROGRESSION. COMPUTATIONAL MODEL CALIBRATION.

Monthly net income of PhDscholarship (max 36 months)
1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The PhD project is part of a broader ERC-funded research initiative aimed at developing an innovative organism-on-chip platform capable of replicating the fibrotic microenvironment of invasive breast cancer. The goal of this PhD project is to better understand the progression of tumor fibrosis and to support the design of more effective, targeted cancer therapies. This specific PhD position will focus on the computational modeling and validation of tumor microenvironment dynamics and on the optimization of an organism-on-a-chip platform, with particular emphasis on the evolution of fibrosis and its impact on drug penetration and efficacy. The candidate will contribute to the development of a multiscale model that integrates biological, mechanical, and pharmacokinetic parameters to simulate tumor progression across different fibrotic stages. https://www.nichoid.polimi.it/beaconsandegg /
Methods and techniques that will be developed and used to carry out the research	The computational model will be calibrated and validated using experimental data generated from the in vivo acquisition made on the tumor-on-chip platform, which involves implantation in the chorioallantoic membrane (CAM) of living chicken embryos. The platform will be optimized to be imaged and to reproduce distinct stages of tumor fibrosis using 3D microstructured scaffolds seeded with cancer cells. These stages will be characterized through high-resolution imaging techniques, including confocal and

	resolution imaging techniques, including confocal and two-photon microscopy, as well as biochemical assays. The PhD candidate will work to integrate imaging, spectroscopic and biochemical data into the computational framework. The model will be used to simulate drug diffusion, cellular response, and therapeutic efficacy under varying fibrotic conditions. A key objective will be to computationally predict the drug dose of FDA-approved and investigational anticancer agents in the tumor microenvironment and compare these predictions with existing in vitro, vivo, and clinical data. This will provide a quantitative basis for validating the organism-on-a-chip platform as an effective tool for preclinical drug screening. The long-term vision of the project is to establish a standardized, ethically sustainable, and physiologically relevant testing system for anticancer therapies. The PhD candidate will gain expertise in computational bioengineering, tumor biology, optical imaging, spectroscopic assays and translational research, contributing to a multidisciplinary team at the forefront of cancer modeling and therapeutic innovation.
Educational objectives	The program will be part of the international project ERC, acronym BEACONSANDEGG, G.A. 101053122 funded by the European Union. The candidate will take part in the research meetings and in the different phases of the project, working in the EU context. Besides acquiring specific expertise in research methodologies, and publishing the obtained results, the candidate will improve on team collaboration, deadline compliance, research reporting.
Job opportunities	The acquired expertise will lead to various job opportunities as a researcher and/or research manager in public research institutions, as well as pharmaceutical and instrumentation companies. Collaborations with a PhD with this level of experience will also benefit companies and institutions interested in applying Nanoscience and Nanoengineering to Regenerative Medicine.

Composition of the research group	1 Full Professors 1 Associated Professors 3 Assistant Professors 1 PhD Students
Name of the research directors	Prof. Manuela Raimondi - Claudio Conci

Contacts
Prof. Manuela T. Raimondi https://www.cmic.polimi.it/en/persone/docenti-e-ricercatori/raimondi-manuela-teresa manuela.raimondi@polimi.it , +39 02 2399 4306 Prof Claudio Conci https://www.cmic.polimi.it/persone/docenti-e-ricercatori/conci-claudio/ claudio.conci@polimi.it, +39 02 23 99 4729

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activity: The student will be encouraged to attend courses at POLIMI or abroad in International Schools. Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. Computer and desk availability: the student will be allowed to access the facilities of the DEIB.