



# PhD in BIOINGEGNERIA / BIOENGINEERING - 39th cycle

## THEMATIC Research Field: DEVELOPMENT OF ADVANCED ORGAN-ON-CHIP TOOLS FOR RESEARCH ON BONE MARROW MODELS

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

Context of the research activity	
<b>Motivation and objectives of the research in this field</b>	<p>Organ-on-Chip (OoC) technology combines the use of microfluidics, biomaterials, and advanced cell cultures in order to generate and monitor miniaturized replicas of human tissues and organs in vitro. It is an enabling technology involving interdisciplinary expertise from the fields of engineering, physics, and cell/molecular biology. Application areas include environmental assessment, toxicological evaluation of chemical agents, drug screening, disease modeling and diagnostic, among others. The aim of the project is to develop in vitro miniaturized bone marrow model able to act as a biological sensor for the early detection of tumor relapse once expose to patient liquid biopsy.</p>
<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>The design and the development of new advanced microscale in vitro platforms will consider state-of-the-art technologies, micro- and nano-fabrication, including organ models previously developed by Prof. Rasponi group at Politecnico di Milano. Computational modeling will be used to optimize geometrical parameters. The proposed research plan is divided into 3 Actions. A1: Development of a new organ-on-chip platform able to host advanced bone marrow models, and definition of a protocol for mimicking healthy and pathological conditions A2: Development of new technologies to sense the changes in the bone marrow environment once subjected to different biochemical and biophysical stimuli linked to insurgence of tumor relapse A3: Integration of the</p>



	insurgence of tumor relapse A3: Integration of the sensing technologies into the organ-on-chip platform and calibration of the system with retrospective clinical data The research will be implemented at the MiMic and EvOoC Laboratories, Department of Electronics, Information and Bioengineering of Politecnico di Milano, while secondment periods may be considered.
<b>Educational objectives</b>	To train the PhD student in organs-on-chip technology, microfluidics, microfabrication, soft-lithography, cell culture applications, micro-bioreactors. <a href="http://www.biomech.polimi.it/mimiclab">http://www.biomech.polimi.it/mimiclab</a> <a href="https://www.polifab.polimi.it/">https://www.polifab.polimi.it/</a>
<b>Job opportunities</b>	The research will be carried out in the context of an EU funded project in cooperation with Istituto dei Tumori (Milano), Lund University (Sweden), IBEC (Spain)
<b>Composition of the research group</b>	1 Full Professors 0 Associated Professors 4 Assistant Professors 6 PhD Students
<b>Name of the research directors</b>	Proff Marco Rasponi - Paola Occhetta

<b>Contacts</b>	
<i>Prof. Marco Rasponi</i> <i>marco.rasponi@polimi.it, +39-02-2399-3377</i>	
<i>Prof. Paola Occhetta</i> <i>paola.occhetta@polimi.it</i>	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

**Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information**



- 1. Educational activity:** The student will be encouraged to attend to courses with subjects in tissue engineering, cell and tissue culture, micro and nanofabrication either at POLIMI or abroad in International Schools.
- 2. 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.
- 3. Computer and desk availability:** the student will be allowed to access facilities of both MiMic Lab and EvOoC Lab of the DEIB.

The research will be carried out by an interdisciplinary research group, bringing both basic and translational research expertise and long-lasting experience in the drug development process. Politecnico di Milano (IT) - POLIMI unit has access to microfabrication facilities. It has renowned experience in developing and studying biological models within custom-designed microfluidic devices for cell cultures and tissue engineering, with a focus in the field of cartilage tissue engineering. The PhD student will join the MiMic Lab research group (<http://www.biomech.polimi.it/mimiclab>), coordinated by Prof. Marco Rasponi, and the EvOoC Lab (headed by Prof. Paola Occhetta)