# PhD in PHYSICS

## Research Title: Development of an optical platform for the manipulation and phase imaging of cell cultures.

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| **Funded by** | MIUR DISAT - Dipartimento di Eccellenza cofinanziata 2x1 |

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| **Context of the research activity** | The Department of Applied Science and Technology (DISAT) is looking for a PhD candidate in the domain of photonic technologies for life sciences. The proposed PhD activity is supported by 3-year funding from the DISAT Excellence Research Project, which generally aims at expanding the department capabilities in optical, electronic and probe microscopy.<br>The PhD project is focused on the development of new techniques for the optical manipulation of living cells in microstructured light-responsive environments. Tuning cells behavior is an important goal in biology . It is known that the chemical and physical features of the surrounding environment can affect different aspects of cell behavior like attachment, differentiation, and also cell fate. A general problem of both 2D and 3D structures for cell cultures is the limited dynamic tunability, due the substantially static nature of the constituent materials. The PhD activity has the ambition to overcome such a limitation, by providing a new technology for a light-driven, reversible and dynamic 3D micro-patterning of functional polymeric materials relevant for cell cultures. Main impact of this research is expected in the field of organoid growth, tissue engineering, regenerative medicine, nerve reparation and setting up of neuronal circuitry. |

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| **Objectives** | The PhD candidate will carry on several activities, whose objectives are described below.<br>- Setting up of technological means for manufacturing light-responsive structures (2D and 3D) by using azopolymeric compounds in combination with fabrication techniques such as optical lithography, direct writing laser lithography, electron beam lithography, 2-photon lithography, soft printing.<br>- Setting up of an optical platform able to provide user-controlled luminous stimuli to light-responsive samples hosting living cells. In addition, the platform should include a non-invasive system based on Quantitative Phase Imaging for long-term observation of cell cultures;<br>- Providing a user-interface able to dynamically control the optical stimuli to the living cells in response to real-time observations, by means of programmable devices such as Spatial Light Modulators or Galvo mirrors |

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| **Skills and competencies for the development of the activity** | The candidates should hold a Master Degree in Physics, Physics Engineering, Optics, Electronics, Nanotechnology or related disciplines.<br>The following competencies/skills are required:<br>- knowledge of fundamental optics and electronics<br>- knowledge of basic clean room fabrication technologies<br>- ability to work in team<br>- ability to carry on experimental work in the lab<br><br>Additional preferred expertise are:<br>- knowledge of scientific programming language such as MatLab<br>- knowledge of Data Acquisition and Device Control by means of LabView<br><br>An excellent knowledge of written and spoken English is required. |