

# PhD in Bioengineering and Medical Surgical-Science

## Research Title: Designing of a CRISPR/Cas platform for organelle nanoengineering.

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| <b>Funded by</b> | Italian Institute for Genomic Medicine/DIMEAS |
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| <b>Supervisor</b> | Carlo C. Campa ( <a href="mailto:carlocosimo.campa@iigm.it">carlocosimo.campa@iigm.it</a> ),<br>Gianluca Ciardelli ( <a href="mailto:gianluca.ciardelli@polito.it">gianluca.ciardelli@polito.it</a> )<br>Clara Mattu ( <a href="mailto:clara.mattu@polito.it">clara.mattu@polito.it</a> ) |
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| <b>Contact</b> | <a href="#">Carlo Cosimo Campa - Google Scholar</a> , <a href="#">DIMEAS - GIANLUCA CIARDELLI</a> |
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| <b>Context of the research activity</b> | <p>A PhD position in “Designing of a CRISPR/Cas platform for organelle nanoengineering” is available in the laboratory of Organelle Morphogenesis, Targeting and Engineering led by Carlo C. Campa at the Italian Institute for Genomic Medicine. The aim of the project is to develop a potent CRISPR/Cas-based platform for precise spatiotemporal control of endocytic organelle functions at the nanoscale.</p> <p>The field of Immunotherapies and Nanomedicines, applied to both cancer treatment and precision medicine, has grown particularly fast in the last two decades. The rapid progress in the ability to characterize intracellular trafficking pathways is associated with improved design of potent pharmacological treatments. For example, recycling antibodies that exploit intracellular transport pathways to escape from unnecessary lysosomal degradation reduce both the dosage and frequency of administration of such expensive and highly-toxic medications to patients.</p> <p>In this scenario, the development of novel CRISPR/Cas-based genome engineering platforms for precise spatiotemporal control of molecular endocytic sorting and intracellular trafficking might</p> |
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|  | <p>provide a strategy to reprogram transport routes underlying drug efficacy.</p> <p>This project is intended to generate novel CRISPR/Cas platforms in which Cas enzymes are engineered to program biochemical reactions at organelle surface. The successful scholar will be trained in genome engineering techniques, design of biomolecular circuits and she/he will design novel assay monitoring localization of biomolecules at elevated spatial resolution. This project will be integrated with other research line in the Organelle Morphogenesis, Targeting and Engineering lab.</p> <p>The position is located at the Italian Institute for Genomic Medicine -IIGM- (Candiolo, 10060, Italy). IIGM supports young scientist in the area of human genomics and life sciences. IIGM is centrally located within the biomedical research hub with close links top Italian Academic Institutions (University of Turin, Polytechnic University of Turin) and the Candiolo Cancer Center.</p> |
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| <p><b>Objectives</b></p> | <p>The Ph.D. student will be responsible for:</p> <ol style="list-style-type: none"> <li>(i) The design and characterization of genome engineering tools (i.e. CRISPR/Cas);</li> <li>(ii) The design and characterization of biochemical circuits involved in endocytic organelle functions.</li> <li>(iii) The programming of genome engineering tools to perturb specific organelle functions defining the efficacy of immunotherapies and nanoparticle-based therapies.</li> <li>(iv) The mapping of organelle identity at the nanoscale.</li> </ol> <p>More in detail, the Ph.D. student will:</p> <ul style="list-style-type: none"> <li>• Design and characterize CRISPR/Cas-based genome engineering tools by RNA-seq, spatial transcriptomics, single-cell RNA seq, time-lapse imaging, FRET microscopy.</li> <li>• Design new tissue models via genome editing technologies that can recapitulate diseased or physiological conditions.</li> <li>• Functionalize organelle with either defined surface patterns or function to enhance the efficacy of immunotherapeutic agents.</li> <li>• Validate the designed engineered organelle from a structural, biochemical and functional point of view.</li> <li>• Use the validated system to test drugs and therapies, such as immunotherapies and to study intra-cellular trafficking of nanomedicines.</li> </ul> |
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**Skills and competencies  
for the development of  
the activity**

We are looking for a highly motivated early-stage researcher (within 2 year from attainment of her/his master's degree) to be integrated in a multidisciplinary team of scientists.

The ideal candidate should have a degree in Biotechnology, Physics, Physics of Complex System, Biomedical Engineering or a related field. The candidate must have experience in at least one of the following disciplines:

- i) Fluorescent microscopy.
- ii) Cell tracking methods.
- iii) Molecular biology.
- iv) Statistical physics and bioinformatics.

The candidate should have good English communication and writing skills. Knowledge in scientific illustration software are a major plus.