

MSCA IF 2020 @UniGe

Supervisor Expression of Interest

MSCA domain
Physics (PHY)

- 1. Prof. Francesco Buatier de Mongeot**
- 2. Prof. Sante Carloni**
- 3. Prof.ssa Ornella Cavalleri**
- 4. Prof. Flavio Gatti**
- 5. Prof.ssa Maria Caterina Giordano**
- 6. Prof. Simone Marzani**

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Supervisor Expression of Interest

1.

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MSCA domain	Physics (PHY)
Research focus area	
Department	Department of Physics
Short description of the department/laboratory/research group	The Nanostructures Laboratory@UNIGE coordinated by Francesco Buatier de Mongeot runs an internationally well recognized activity on the growth and functionalization of nanostructured surfaces/interfaces recurring to self-organised approaches and to top-down lithography. The core of the activity is currently oriented to : (1) Develop scalable strategies for growth of large-area 2D semiconductor materials with high quality transport properties as building blocks for the fabrication of VdW heterostructures and devices; (2) Develop innovative photon-harvesting strategies for manipulating and capturing light in the ultrathin atomic layer regime. (3) Develop innovative photon-harvesting platforms based on plasmon arrays for energy harvesting, photodetectio,

	<p>photocatalysis and plasmon enhanced spectroscopies.</p> <p>The following techniques are available (a) Prototype apparatus for self-organised nanopatterning based on defocused (a) Ion beam sputtering and ion induced wrinkling (b) large area lithographic techniques based on laser interference lithography (c) Nanofabrication and surface modification by Thermal Scanning Probe Lithography (t-SPL) with a NanoFrazor setup (d) nanofabrication by Electron Beam Lithography - EBL, (e) deposition facility of ultrathin films and 2D materials. The characterization of the nanostructured samples will be performed (f) recurring to scanning probe microscopy (ambient AFM), (g) to scanning electron microscopy (SEM), (h) to Optical spectroscopy and electrical transport measurements, (i) to confocal Raman and Photoluminescence microspectroscopy.</p>
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MSCA domain	Physics (PHY)
Research focus area	Relativistic gravitation, cosmology, astrophysics, modifications of General Relativity (non minimally coupled theories, torsion, Lorentz violations), gravitational approach to transformational metamaterials.
Department	Ingegneria Meccanica Energetica Gestionale Trasporti
Short description of the department/laboratory/research group	We are a small research group that works on several topics of mathematical, quantum and gravitational physics. We are also interested in multidisciplinary projects that connect these fields to research in engineering (e.g. metamaterials).
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MSCA domain	Physics (PHY)
Research focus area	<p>The focus of the project is the study of the interaction between a model system mimicking the virus membrane with different cell systems as a function of different competing agents in a therapeutical screening perspective.</p> <p>The methodological approach combines advanced biophysical and bioengineering strategies.</p> <p>The first step will focus on the design of a functionalized surface able to reproduce the viral envelope exposing the spike proteins which control the attachment to the host cell.</p> <p>This functionalization strategy will be exploited at two different levels on: (i) microfluidic devices, (ii) extended surfaces with different geometries and chemical properties.</p> <p>The development of microfluidic systems will allow for the fast and high throughput screening of virus/cell interaction events to evaluate the inhibitory/promoting effect of potentially therapeutical molecules.</p>

	<p>Single cell force spectroscopy will be employed for a detailed characterization of the forces that drive the virus adhesion at the single molecule level. This biophysical approach will represent a step-forward towards a deeper understanding of the molecular mechanisms behind the virus infection.</p>
<p>Department</p>	<p>Department of Physics, University of Genova</p>
<p>Short description of the department/laboratory/research group</p>	<p>The research group operates within the biophysical platform at the Department of Physics of the University of Genova. The Department of Physics has been recently awarded as Department of Excellence by the Italian Ministry of University and Research. The group has a well-established expertise in the preparation and characterization of multi-functional surfaces and biomimetic membranes, design and development of microfluidic systems for cell handling, advanced scanning probe microscopy and optical microscopy and spectroscopy.</p> <p>Selected publications:</p> <ul style="list-style-type: none"> - P. Guida, E. Piscitelli, M. Marrese, V. Martino, V. Cirillo, V. Guarino, E. Angeli, C. Cocola, P. Pelucchi, L. Repetto, G. Firpo, T. Karnavas, M. Gotte, A. Gritzapis, M. D'Albore, D. Repetto, D. Pezzuoli, I. Missitzis, G. Porta, G. Bertalot, G. Bellipanni, I. Zucchi, L. Ambrosio, U. Valbusa, R. Reinbold. "Integrating microstructured electrospun scaffolds in an open microfluidic system for in-vitro studies of human patient-derived primary cells", ACS Biomater. Sci. Eng. 2020, doi:10.1021/acsbiomaterials.0c00352 - G Pinto, P Parisse, I Solano, P Canepa, M Canepa, L Casalis, O Cavalleri, Functionalizing gold with single strand DNA: novel insight into

	<p>optical properties via combined spectroscopic ellipsometry and nanolithography measurements. <i>Soft matter</i> 8 (2019) 15 (11), 2463-2468</p> <p>- M. Cosentino, P. Bianchini, C. Canale, A. Diaspro. AFM-STED correlative nanoscopy reveals a dark side in fluorescence microscopy imaging. <i>Sci. Adv.</i> (2019) 5: eaav8062, doi: 10.1126/sciadv.aav8062</p> <p>- S. Oropesa-Nuñez R., Keshavan, S. Dante, A. Diaspro, B. Mannini, C. Capitini, C. Cecchi, M. Stefani, F. Chiti, C. Canale, Toxic HypF-N Oligomers Selectively Bind the Plasma Membrane to Impair Cell Adhesion Capability. <i>Biophys. J.</i> (2018) 114(6):1357-1367 https://doi.org/10.1016/j.bpj.2018.02.003</p> <p>- V. Benedetti, V. Brizi, P. Guida, S. Tomasoni, O. Ciampi, E. Angeli, U. Valbusa, A. Benigni, G. Remuzzi, C. Xinaris, "Engineered Kidney Tubules for Modeling Patient-Specific Diseases and Drug Discovery", <i>EBioMedicine</i>, Volume 33, 253-268 (2018), doi: 10.1016/j.ebiom.2018.06.005.</p> <p>- C. Canale, A. Petrelli, M. Salerno, A. Diaspro, S. Dante. A new quantitative experimental approach to investigate single cell adhesion on multifunctional substrates. <i>Biosens. Bioelectron.</i> (2013) 48:172-179, doi: 10.1016/j.bios.2013.04.015</p>
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MSCA domain	Physics (PHY)
Research focus area	Astroparticle Physics with particular emphasis to high energy astrophysics and cosmology searches for dark matter and role of elementary particles in the evolution of the Universe.
Department	Department of Physics
Short description of the department/laboratory/research group	Genoa LTD group at the Physics Department of the University of Genova (Italy) moved the first steps in the '90s investigating the possibility to improve the sensitivity of neutrino's mass measurements with low temperature detectors (LTD) operating at 0.1K. Subsequently, he extended the field of interest to X-ray Astrophysics and CMB with the aim exploring the role of elementary particles, and in particular of neutrinos, to the evolution of the Universe constituents and to obtain feedbacks about their properties that can't be revealed with experiments on Earth. The group established the LTDlab, where it is possible to design and manufacture superconducting detectors for these purposes. Genoa LTD group is responsible for the design and fabrication of one of the two

	detectors, the CyoAC, of the focal plane of the future Athena X-ray Space Telescope (ESA) and the superconducting TES bolometers for the CMB polarisation on board of the stratospheric balloon borne LSPE telescope (ASI project) for a winter flight at the north pole. He is also the proponent and partner of the HOLMES (ERC project) for the direct measurement of the neutrino mass in the laboratory.
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MSCA domain	Physics (PHY)
Research focus area	The research activity will be focused on nanofabrication of nanostructure arrays and nanodevices for optoelectronics, plasmonics and biosensing applications. In particular, Electron Beam Lithography and Scanning Probe Lithography techniques will be exploited in order to achieve nanoscale control on plasmonic nanoantennas and/or layered 2D materials and tailor effectively light-matter interaction in metasurfaces and nanodevices.
Department	Physics Department- University of Genova
Short description of the department/laboratory/research group	The research activity of the group is mainly devoted to nanopatterning and growth of nanomaterials for photonics, optoelectronics, and plasmonic applications. In particular, two main research lines are present: the first one involves large area nanopatterning and growth of nanomaterials via self-organized approaches (e.g. defocused ion beam irradiation). The second one involves advanced nanolithography techniques for the fabrication of plasmonic

	nanoantennas and atomic 2D nanodevices for nanophotonics.
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MSCA domain	Physics (PHY)
Research focus area	<p>Our group research is focused on the phenomenology of fundamental interactions, which constitutes the link between theory and experiments in particle physics. In particular, we are interested in precision perturbative calculations in the context of the Standard Model, including strong and electroweak interactions, the physics of hadronic jets and their substructure, as well as the physics of the Higgs boson, exploiting both analytical calculations and numerical simulations.</p> <p>We are also interested in the study of theories that describe particles and interactions beyond the Standard Model, both from a model building perspective, such as supersymmetry, Higgs composite models and neutrino-mass models, and from a model-independent one, through the use of Effective Field Theory.</p>



	Finally, our interests expand to applications of Machine Learning and data science techniques to High Energy Physics, both from the experimental and theoretical sides.
Department	Department of Physic
Short description of the department/laboratory/research group	The particle physics phenomenology group is composed of faculty members from the University of Genova (Carla Biggio, Simone Marzani, Giovanni Ridolfi) and INFN staff (Stefano Frixione and Riccardo Torre). The group currently includes four postdoctoral researchers and and four PhD students. Every year, we also enjoy a good number of Master students.
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