

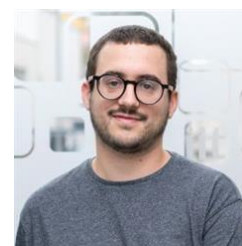
# Nicolò Maccaferri

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<https://scholar.google.com/citations?user=wXOceFgAAAAJ&hl=it> (h-index: 20, citations: >1050)

## Academic background and summary of my research activities

Since 2019, Research Associate and Principal Investigator at the University of Luxembourg supported by the Luxembourg National Research Fund and the European Union. Previous research experiences in Spain, Sweden, Italy, and Finland. Author of more than 45 scientific papers in renowned international journals (including *Physical Review Letters*, *Nature Communications*, *Advanced Optical Materials* and *Nano Letters*), with more than 70 contributions at international conferences, international symposia, and colloquia, some of them as invited speaker. Co-author of two patents applications on metamaterials for nanophotonic applications. The main objective of my research is to develop novel concepts in nanomaterials science by investigating the physical properties of multi-functional nanoscale metamaterials of high technological interest, in particular opto-electronics, nanophotonics and bio-technology, using advanced spectroscopy techniques (e.g. pump-probe and magneto-optical spectroscopy), finite element numerical methods, and bottom-up/top-down fabrication approaches. My current research activities can be summarized as follows:

- **Ultrafast charge and spin dynamics in (magneto)plasmonic nanomaterials:** here we focus on the generation and investigation of plasmonic excitations at visible and mid-infrared frequencies to achieve nanoscale plasmon-driven sub-optical-cycle control of several physical mechanisms in metals, semiconductors and strongly correlated materials. We target plasmon-driven electron-electron and electron-phonon interactions, magnons excitation mediated by phonons, phase transitions and critical phenomena, non-thermal and thermal charge and spin generation, injection and manipulation, as well as harnessing coherently plasmonic and spin excitations to achieve a full control of novel magnetophotonic hybrid states beyond the current THz limits.
- **Multi-functional metamaterials for bio-nanophotonics:** here we aim to study i) the fundamental physical properties of nanostructured plasmonic multi-functional metamaterials (e.g. super-chiral effects, harmonic generation and photo-thermal control of chemical reactions), which combine different functions (e.g. optical, magnetic, and thermal), and ii) their coupling with other materials, such as quantum emitters and molecules for plasmon-driven nanochemistry. The nanodevices studied here can be used as well for enhancing single-molecule spectroscopies, developing novel opto-acoustic imaging approaches and thermoplasmonic methodologies applied to personalized medicine challenges (e.g. localized hyperthermia and controlled drug delivery).

## Work experience

- 01/2020-present: Principal Investigator, University of Luxembourg, Department of Physics and Materials Science.
  - 01/2019-present: Research Associate and Lecturer, University of Luxembourg (Luxembourg), Department of Physics and Materials Science, Ultrafast Condensed Matter Physics Group.
  - 12/2016-12/2018: Research Associate, Italian Institute of Technology (Genoa, Italy), Plasmon Nanotechnologies Unit.
  - 10/2012-12/2016: Doctoral Researcher, CIC nanoGUNE (Donostia-San Sebastian, Spain), Nanomagnetism Group.
  - 03/2012-10/2012: Graduate Research Assistant at CIC nanoGUNE (Donostia-San Sebastián, Spain) in the Nanomagnetism group.
  - 05/2010-09/2010: Undergraduate Research Assistant at Physics Department of University of Ferrara (Italy).
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## Scientific visits

- 06/2019: Visiting Researcher, Chair Leitenstorfer - Ultrafast Phenomena and Photonics, Department of Physics, University of Konstanz (Germany).
  - 09/2015-11/2015: Visiting Scientist at Chalmers University of Technology (Gothenburg, Sweden), Department of Applied Physics, Nanobiophotonics Division.
  - 02/2014-06/2014: Visiting Scientist for short periods at Aalto University – School of Science (Espoo, Finland), Department of Applied Physics, NanoSpin Group.
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## Supervising experience

In the past seven years, I have gathered a lot of experience as supervisor of bachelor, master and doctoral students. During my doctoral studies I co-supervised two undergraduate and two graduate students at CIC nanoGUNE working on the study of the interplay between plasmons and magneto-optical activity in ferromagnetic nanostructures. In two years at the Italian Institute of Technology, I have co-supervised a PhD student working on the fabrication, optical characterization and modelling of plasmonic hyperbolic metamaterials, and supervised an undergraduate student in Economics at the University of Genova to develop a business plan related to the opening of a spin-off on optical nanotechnologies for therapeutic applications. In 2019, I have co-supervised a Master student at the Department of Physics of the University of Konstanz working on ultrafast magnetoplasmonics in nanostructures supporting hybrid bright-dark plasmons and on all-optical switching in epsilon-near-zero nanocavities (Best Master Thesis in Physics 2020). At the University of Luxembourg, I am currently co-supervising two PhD students working on ultrafast plasmonics in the mid-infrared and hot electron injection in layered materials, and I am supervising a Master student working on ultrafast dynamics of cold electrons and spins in nanoscale magnetophotonic nanostructures.

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## Teaching experience

During my pre-doctoral experience at CIC nanoGUNE (Spain), I was Visiting Teaching Assistant for the Master in Physics course “Magnetic properties of matter and laboratory” at the University of

Ferrara (Italy) during the Academic Year 2014-2015. At the University of Luxembourg, I am Teaching Assistant for the Bachelor in Physics course “Optics” since 2019, and for the Master in Physics course “Laser Physics” since 2020. Since 2019, I am also stand-in Lecturer for the Bachelor in Physics course “Thermodynamics”. In the summer semester 2020-2021, I will also start a course for PhD students enrolled in the Doctoral School in Science and Engineering of the University of Luxembourg entitled “Principle of Nano-Optics”, covering the fundamental aspects of nano-optics, nanophotonics and plasmonics, and their most important applications.

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## Education

- Since November 2020: National Italian Habilitation to Associate Professor in Experimental Condensed Matter Physics (02/B1 - Fisica Sperimentale della Materia).
  - 2012-2016: Ph. D. in Physics of Nanostructures and Advanced Materials – University of the Basque Country (thesis work carried out at CIC nanoGUNE, San Sebastian, Spain). Final evaluation: Outstanding Cum Laude.
  - 2010-2012: M. Sc. in Physics (Condensed Matter) – University of Ferrara (thesis work carried out at CIC nanoGUNE, San Sebastian, Spain). Final evaluation: 110/110 Cum Laude.
  - 2007-2010: B. Sc. In Physics and Astrophysics – University of Ferrara. Final evaluation: 110/110.
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## Other education and expertise

- 2021: VIRTU2E training for upholding the principles and practices of the European Code of Conduct for Research Integrity.
  - 2020: Habilitation to Associate Professor in Experimental Condensed Matter Physics by the Italian Ministry of Higher Education and Research.
  - 2019: “University of Luxembourg Leadership Academy” (main topics: “Leadership & Self-Management”, “Conflict Management”, “Project Management for Professional Research”).
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## List of Publications

### Published/In press

1. “Enhanced nonlinear optical response of single metal–dielectric nanocavities resonating in the near-infrared” **N. Maccaferri**, A. Zilli, T. Isoniemi, L. Ghirardini, M. Iarossi, M. Finazzi, M. Celebrano, and F. De Angelis – *ACS Photonics*, **8**(2), 512-520 (2021). [Research Article](#).
2. “Recent advances on plasmonic nanocavities for single-molecule spectroscopy” **N. Maccaferri**, G. Barbillon, A. N. Koya, G. Lu, G. P. Acuna, and D. Garoli – *Nanoscale Advances*, **3**, 633-642 (2021). [Invited Mini-Review](#). [Front cover](#).
3. “Hyperbolic dispersion metasurfaces for molecular biosensing” G. Palermo, K. V. Sreekanth, **N. Maccaferri**, G. E. Lio, G. Nicoletta, F. De Angelis, M. Hinczewski, and G. Strangi – *Nanophotonics*, **10**(1), 295–314 (2021). [Invited Review](#).
4. “Near- and mid-infrared graphene-based photonic architectures for ultrafast and low-power electro-optical switching and ultra-high resolution imaging” V. Caligiuri, A. Pianelli, M. Miscuglio, A. Patra, **N. Maccaferri**, R. Caputo, A. De Luca, *ACS Applied Nano Materials*, **3**(12), 12218-12230 (2020). [Research Article](#).

5. "Förster resonance energy transfer via diffusion in a functionalized plasmonic nanopore" X. Zambrana-Puyalto, P. Ponzellini, **N. Maccaferri**, and D. Garoli – *Physical Review Applied*, **14**(5), 054065 (2020). [Research Article](#).
6. "λ-DNA Through porous materials–Surface Enhanced Raman Scattering in a simple plasmonic nanopore" A. Hubarevich, J.-A. Huang, G. Giovannini, A. Schirato, Y. Zhao, **N. Maccaferri**, F. De Angelis, A. Alabastri, and D. Garoli – *The Journal of Physical Chemistry C*, **124**(41), 22663-22670 (2020). [Research Article](#).
7. "Speeding up nanoscience and nanotechnology with ultrafast plasmonics" **N. Maccaferri**, S. Meuret, N. Kornienko, and D. Jariwala *Nano Letters*, **20**(8), 5593–5596 (2020). [Editorial](#).
8. "Plasmon hybridization in compressible metal-insulator-metal nano-cavities: an optical approach for sensing deep sub-wavelength deformation" A. Carrara, **N. Maccaferri**, A. Cerea, A. Bozzola, F. De Angelis, R. Proietti Zaccaria, and A. Toma – *Advanced Optical Materials*, **8**(18), 2000609 (2020). [Research Article](#).
9. "Designer Bloch plasmon polariton dispersion in hyperbolic meta-gratings" **N. Maccaferri**, T. Isoniemi, M. Hinczewski, M. Iarossi, G. Strangi, and F. De Angelis *APL Photonics*, **5**(7), 076109 (2020). [Research Article](#).
10. "Ultrafast all-optical switching enabled by epsilon-near-zero-tailored absorption in metal-insulator nanocavities" J. Kuttruff, D. Garoli, J. Allerbeck, R. Krahne, A. De Luca, D. Brida, V. Caligiuri, and **N. Maccaferri** – *Communications Physics*, **3**, 114 (2020). [Research Article](#).
11. "Electron energy loss spectroscopy of bright and dark modes in hyperbolic metamaterial nanostructures" T. Isoniemi, **N. Maccaferri**, Q. M. Ramasse, G. Strangi, and F. De Angelis – *Advanced Optical Materials*, **8**(13), 2000277 (2020). [Research Article](#). [Front cover](#).
12. "Switchable two-state plasmonic tweezers for dynamic manipulation of nano-objects" G. C. Messina, X. Zambrana-Puyalto, **N. Maccaferri**, D. Garoli, and F. De Angelis – *Nanoscale*, **12**, 8574-8581 (2020). [Research Article](#).
13. "Magnetoplasmonics in nanocavities: Dark plasmons enhance magneto-optics beyond the intrinsic limit of magnetoplasmonic nanoantennas" A. López-Ortega, M. Zapata-Herrera, **N. Maccaferri**, M. Pancaldi, M. Garcia, A. Chuvilin, and P. Vavassori – *Light: Science & Applications*, **9**, 49 (2020). [Research Article](#).
14. "Nanoparticles manipulation in 3D nanotips excited with plasmonic vortex" Y. Shen, **N. Maccaferri**, K. Liu, X. Li, R. Proietti Zaccaria, X. J. Zhang, Y. Gorodetski, and D. Garoli – *Optics Letters*, **45**(4), 823-826 (2020). [Research Article](#).
15. "Machine learning in nanoscience: big data at small scales" K. A. Brown, S. Brittman, **N. Maccaferri**, D. Jariwala, and U. Celano – *Nano Letters*, **20**(1), 2-10 (2020). [Invited Mini Review](#).
16. "Bio-assisted tailored synthesis of plasmonic silver nanorings and site-selective deposition on graphene arrays" G. Giovannini, M. Ardini, **N. Maccaferri**, X. Zambrana-Puyalto, G. Panella, F. Angelucci, R. Ippoliti, D. Garoli, and F. De Angelis – *Advanced Optical Materials*, **8**(4), 1901583 (2020). [Research article](#).
17. "Nanoscale magnetophotonics" **N. Maccaferri**, I. Zubritskaya, I. Razdolski, I.-A. Chioar, V. Belotelov, V. Kapaklis, P. M. Oppeneer, and A. Dmitriev – *Journal of Applied Physics*, **127**(8), 080903 (2020). [Invited Perspective](#).

18. "Intracellular recording of human cardiac action potentials on market-available multielectrode array platforms" G. Melle, G. Bruno, N. Maccaferri, G. Iachetta, N. Colistra, A. Barbaglia, M. Dipalo, F. De Angelis – *Frontiers in Bioengineering and Biotechnology*, **8**, 66 (2020). [Research Article](#).
19. "Chasing plasmons in flatland" U. Celano and **N. Maccaferri** – *Nano Letters*, **19**(11), 7549-7552 (2019). [Editorial](#).
20. "Plasmonic nanopores for single-molecule detection and manipulation: towards sequencing applications" D. Garoli, H. Yamazaki, **N. Maccaferri**, and M. Wanunu – *Nano Letters*, **19**(11), 7553-7562 (2019). [Invited Mini Review](#).
21. "Electrophoretic deposition of WS<sub>2</sub> flakes on nanoholes arrays - Role of used suspension medium" D. Mosconi, G. Giovannini, **N. Maccaferri**, M. Serri, S. Agnoli, and D. Garoli – *Materials* **12** (20), 3286 (2019). [Research article](#).
22. "Hybrid metal-dielectric plasmonic zero mode waveguide for enhanced single molecule detection" X. Zambrana-Puyalto, P. Ponzellini, **N. Maccaferri**, E. Tessarolo, M. G. Pelizzo, W. Zhang, G. Barbillon, G. Lu, and D. Garoli – *Chemical Communications*, **55**, 9725-9728 (2019). [Research article](#).
23. "Tunable magnetoplasmonics in lattices of Ni/SiO<sub>2</sub>/Au dimers" S. Pourjamal, M. Kataja, **N. Maccaferri**, P. Vavassori, and S. van Dijken – *Scientific Reports*, **9**, 9907 (2019). [Research article](#).
24. "Coupling phenomena and collective effects in resonant meta-atoms supporting both plasmonic and (opto-)magnetic functionalities: an overview on properties and applications" **N. Maccaferri** – *Journal of the Optical Society of America B*, **36**(7), E112-E131 (2019). [Invited Review in "Collective effects and coupling phenomena in resonant optical metasurfaces" Feature Issue](#).
25. "Site-selective functionalization of plasmonic nanopores for enhanced fluorescence and Förster Resonance Energy Transfer" X. Zambrana-Puyalto, **N. Maccaferri**, P. Ponzellini, G. Giovannini, F. De Angelis, and D. Garoli – *Nanoscale Advances*, **1**(6), 2454-2461 (2019). [Research article](#).
26. "Site-selective integration of MoS<sub>2</sub> flakes on nanopores by means of electrophoretic deposition" D. Mosconi, G. Giovannini, A. Jacassi, P. Ponzellini, **N. Maccaferri**, P. Vavassori, M. Serri, M. Dipalo, F. De Angelis, S. Agnoli, and D. Garoli – *ACS Omega* **4**(5), 9294-9300 (2019). [Research article](#).
27. "Hyperbolic meta-antennas enable full control of scattering and absorption of light" **N. Maccaferri**, Y. Zhao, T. Isoniemi, M. Iarossi, A. Parracino, G. Strangi, and F. De Angelis – *Nano Letters* **19**(3), 1851–1859 (2019). [Research article](#).
28. "On-demand intracellular delivery of single particles in single cells by 3D hollow nanoelectrodes" J.-A. Huang, V. Caprettini, Y. Zhao, G. Melle, **N. Maccaferri**, L. Deleye, X. Zambrana-Puyalto, M. Ardini, F. Tantussi, M. Dipalo, and F. De Angelis – *Nano Letters* **19**(2), 722–731 (2019). [Research article](#).
29. "Enhanced Raman investigation of cell membrane and intracellular compounds by 3D plasmonic nanoelectrode arrays" V. Caprettini, J. A. Huang, F. Moia, A. Jacassi, C. A. Gonano, **N. Maccaferri**, R. Capozza, M. Dipalo, and F. De Angelis – *Advanced Science* **5**(12), 1800560 (2018). [Research article](#).

30. "Plasmonic zero mode waveguide for enhanced confined fluorescence emission" P. Ponzellini§, X. Zambrana-Puyalto§, **N. Maccaferri**, L. Lanzañò, F. De Angelis, and D. Garoli¶ – *Nanoscale* **10**, 17362-17369 (2018). [Research article](#).
31. "Hybrid plasmonic nanostructures based on controlled integration of MoS<sub>2</sub> flakes on metallic nanoholes" D. Garoli, D. Mosconi, E. Miele, **N. Maccaferri**, M. Ardini, G. Giovannini, M. Dipalo, S. Agnoli, and F. De Angelis – *Nanoscale* **10**, 17105-17111 (2018). [Research article](#).
32. "Live intracellular biorthogonal imaging by surface enhanced Raman spectroscopy using alkyne-silver nanoparticles clusters" M. Ardini, J.-A. Huang, C. Sánchez Sánchez, M. Z. Mousavi, V. Caprettini, **N. Maccaferri**, G. Melle, G. Bruno, L. Pasquale, D. Garoli¶, and F. De Angelis¶ – *Scientific Reports* **8**, 12652 (2018). [Research article](#).
33. "Hybrid Ni/SiO<sub>2</sub>/Au dimer arrays for high-resolution refractive index sensing" S. Pourjamal, M. Kataja, **N. Maccaferri**, P. Vavassori, and S. van Dijken¶ – *Nanophotonics* **7**(5), 905-912 (2018). [Research article](#).
34. "Magnetic control of the chiroptical plasmonic surfaces" I. Zubritskaya§¶, **N. Maccaferri**§, X. Inchausti Ezeiza, P. Vavassori¶, and A. Dmitriev¶ – *Nano Letters* **18**(1), 302-307 (2018). [Research article](#).
35. "Magnetoplasmonic control of plasmonic vortices" **N. Maccaferri**¶, Y. Gorodetski¶, A. Toma, P. Zilio, F. De Angelis, and D. Garoli¶ – *Applied Physics Letters* **111**(20) 201104 (2017). [Research article](#).
36. "Scanning probe nanojet lithography", A. Jacassi, F. Tantussi, M. Dipalo, C. Biagini, **N. Maccaferri**, A. Bozzola, and F. De Angelis¶ – *ACS Applied Materials and Interfaces* **9**(37), 32386-32393 (2017). [Research article](#).
37. "Polarization conversion-based sensing scheme using anisotropic plasmonic metasurfaces" R. Verre¶, **N. Maccaferri**, K. Fleischer, M. Svedendahl, N. O. Länk, A. Dmitriev, P. Vavassori, I.V. Shvets and M. Käll¶ *Nanoscale* **8**, 10576-10581 (2016). [Research article](#).
38. "Anisotropic nanoantenna-based magnetoplasmonic crystals for highly enhanced and tunable magneto-optical activity" **N. Maccaferri**§¶, L. Bergamini§, M. Pancaldi§, M. K. Schmidt, M. Kataja, S. van Dijken, N. Zabala, J. Aizpurua, and P. Vavassori¶ *Nano Letters* **16**(4), 2533-2542 (2016). [Research article](#).
39. "Hybrid plasmonic lattices with tunable magneto-optical activity" M. Kataja, S. Pourjamal, **N. Maccaferri**, P. Vavassori, T. K. Hakala, M. J. Huttunen, P. Törmä, and S. van Dijken¶ *Optics Express*, **24**(4), 3652-3662 (2016). [Research article](#).
40. "Resonant enhancement of magneto-optical activity induced by surface plasmon polariton modes in 2D magnetoplasmonic crystals" **N. Maccaferri**, A. Garcia-Martin, J. C. Cuevas, X. Inchausti, D. Tripathy, A. Adeyeye, and P. Vavassori¶ *ACS Photonics* **2**(12), 1769-1779 (2015). [Research article](#).
41. "Active magnetoplasmonic ruler" Zubritskaya¶, K. Lodewijks, **N. Maccaferri**¶, A. Mekonnen, R. Dumas, J. Åkerman, P. Vavassori, and A. Dmitriev¶ *Nano Letters*, **15**(5), 3207-3211 (2015). [Research article](#).
42. "Ultrasensitive and label-free molecular level detection enabled by light phase control in magnetoplasmonic nanoantennas" **N. Maccaferri**, K. Gregorczyk, T. V. A. G. De Oliveira, M.

- Kataja, S. van Dijken, Z. Pirzadeh, A. Dmitriev, J. Åkerman, M. Knez, and P. Vavassori† Nature Communications 6, 6150 (2015). [Research article](#).
43. "Magnetoplasmonic design rules for active magneto-optics" K. Lodewijks§†, **N. Maccaferri**§†, T. Pakizeh, R. Dumas, I. Zubritskaya, J. Åkerman, P. Vavassori, and A. Dmitriev† Nano Letters **14**(12), 7207-7214 (2014). [Research article](#).
44. "Effects of a non-absorbing substrate on magneto-optical Kerr response of plasmonic ferromagnetic nanodisks" **N. Maccaferri**, M. Kataja, V. Bonanni, S. Bonetti, , Z. Pirzadeh, A. Dmitriev, S. van Dijken, J. Åkerman, and P. Vavassori† Physica Status Solidi (A), **211**(5), 1067-1075 (2014). [Invited article in "Nanoscaled Magnetism and Applications" Topical Section](#).
45. "Tuning the magneto-optical response of nanosize ferromagnetic Ni disks using the phase of localized plasmons" **N. Maccaferri**, A. Berger, S. Bonetti, V. Bonanni, M. Kataja, Q.-H. Qin, S. van Dijken, Z. Pirzadeh, A. Dmitriev, J. Nogués, J. Åkerman, and P. Vavassori† Physical Review Letters 111(16), 167401 (2013). [Research article](#).
46. "Polarizability and magnetoplasmonic properties of magnetic generalized nanoellipsoids" **N. Maccaferri**†, J. B. González-Díaz, S. Bonetti, A. Berger, M. Kataja, S. van Dijken, J. Nogués, V. Bonanni, Z. Pirzadeh, A. Dmitriev, J. Åkerman, and P. Vavassori† Optics Express **21**(8), 9875-9889 (2013). [Research article](#).

## Pre-prints

47. "Control of particle trapping in a magnetoplasmonic nanopore" **N. Maccaferri**, P. Vavassori, and D. Garoli – arXiv:2102.01382. [Research Article](#).
48. "Hyperbolic metamaterial nanoparticles for efficient hyperthermia in the II and III near-infrared windows" Y. Zhao, M. Iarossi, **N. Maccaferri**, L. Deleye, G. Melle, J.-A. Huang, F. Tantussi, T. Isoniemi, and F. De Angelis – arXiv:2005.13296. [Research Article](#).

† Corresponding author.

§ These authors share first authorship.

## Patents Applications

1. "HYPERBOLIC METAMATERIAL-BASED NANOPARTICLES FOR PLASMONIC APPLICATIONS" F. De Angelis, **N. Maccaferri**, A. Parracino, Y. Zhao, Tommi Juhani Isoniemi – PCT International Application No. PCT/IB2019/055630, July 2, 2019.
2. "HYPERBOLIC METAMATERIAL-BASED NANOPARTICLES FOR PLASMONIC APPLICATIONS" F. De Angelis, **N. Maccaferri**, A. Parracino, Y. Zhao, Tommi Isoniemi – Italian Patent Application No. 102018000006880, July 3, 2018.

## Invited Talks

### Upcoming

1. "EUROMAT 2021" (September 12-16 2021, Graz, Austria) "Controlling light-matter interactions with hybrid metal-dielectric metamaterials" (Special Session "Materials for photonics and optics.").

2. "SPIE Nanoscience + Engineering" (August 1-5 2021, San Diego, USA) "Magneto-optics in hyperbolic nanomaterials" (Symposium "Spintronics XIV").
3. "META21 – 11th International Conference on Metamaterials, Photonic Crystals and Plasmonics" (July 20-23 2021, Warsaw, Poland) "Time- and Field-Resolved Response of Plasmonic Nanostructures and Their Applications to Single-Molecule Detection and Manipulation" (Special Session "Plasmonics for single molecule detection and manipulation").
4. "CIMTEC 2021 - 15th International Conference on Modern Materials and Technologies – 9<sup>th</sup> Forum on New Materials – Special Symposium on "Electromagnetic Metamaterials and Metasurfaces: Recent Research Achievements and New Paradigms" (June 21-25 2021, Montecatini Terme, Italy) "Nanoscale magnetophotonics and optical metamaterials: fundamentals and applications".

## Past

5. "Biennial meeting of the Condensed Matter Divisions of the Spanish Royal Physics Society (RSEF-GEFES) and of the European Physical Society" (August 31 – September 4 2020, Madrid, Spain) "Nanoscale magnetophotonics: current advances and future perspectives".
6. "The 37th International Symposium on Dynamical Properties of Solids - DyProSo 2019" (September 8-12 2019, Ferrara, Italy) "Time-resolved investigations and biotechnological applications of plasmonic nanostructures".
7. "META19 – 10th International Conference on Metamaterials, Photonic Crystals and Plasmonics" (July 23-26 2019, Lisbon, Portugal) "Hyperbolic nanostructures: a new way to manipulate absorption and scattering of light and their thermo-plasmonic bio-medical applications" (Special Symposium "New trends in nanophotonics and advanced materials").
8. "PIERS 2019" (June 17-20 2019, Rome, Italy). "Hyperbolic meta-antennas: arbitrary control of light scattering and absorption towards thermo-plasmonic bio-medical applications" (Special Session "Thermoplasmonics and Photo-thermal Applications").
9. "META18 – 9th International Conference on Metamaterials, Photonic Crystals and Plasmonics" (June 24-July 1 2018, Marseille, France) "Nanostructured magnetoplasmonic metamaterials: from extreme bio-sensing to active control of light polarization states at the nanoscale" (Special Session "Extraordinary topological effects and singular plasmonics").

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## Invited Lectures and Colloquia

1. Invited Seminar at University of Le Mans (November 21 2019, Le Mans, France) "Time-resolved response and biotechnological applications of nanoscale plasmonic architectures". Host: Prof. Vasily Temnov.
2. Invited Colloquium at Dortmund Technical University – Department of Physics (July 12 2017, Dortmund, Germany) "Nanostructured plasmonic and magnetoplasmonic metamaterials: from extreme bio-sensing to active control of light polarization states at the nanoscale". Host: Prof. Mirko Cinchetti.



- Invited Seminar at Uppsala University – Angstrom Laboratories, (November 19 2015, Uppsala, Sweden) “Magnetoplasmonic metasurfaces for active control of light at the nanoscale” Host: Prof. Vassilios Kaplakis.
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## Awards

- January 2021: attendance to the first European Crucible event. The European Crucible is a premier research leadership and development program for early/mid-career European researchers that offers opportunities to build new research collaborations at the interfaces between life, physical, engineering, computational, mathematical, environmental, and social sciences, arts and humanities.
  - March 2020: awarded financial support to write a H2020-FET-OPEN-2020 proposal involving international partners. Funding Organization: University of Luxembourg. Total funding: 10 k€.
  - September 2019: awarded financial support for the purchase of a marketing analysis for the writing of a H2020-EIC-FETPROACT-2019 proposal involving international partners. Funding Organization: University of Luxembourg. Total funding: 10 k€. (Project won in November 2020 as FET Open, total funding 3 M€).
  - April 2018: selected member of the *Nano Letters* Early Career Editorial Board.
  - January 2017: Basque Government Award for International PhD Thesis. The Award was assigned for defending a PhD Thesis with International mention and a final grade of "Outstanding Cum Laude".
  - September 2015: “Piero Brovetto” Award for young laureate in Physics by the Italian Society of Physics (SIF). The award was given for my contributions in the field of nanomagnetism and nanooptics and the study of the physical properties of magnetoplasmonic nanoantennas and their application in bio-sensing.
  - 2014: Student travel award to attend the conference “CEN2014 (Spanish Conference on Nanophotonics) (Santander May 14-16 2014, Spain).
  - 2014: Student travel award to attend the conference “NanoPortugal 2014 (NanoPT 2014)” (Oporto February 12-14 2014, Portugal).
  - 2013: Student travel award to attend the “IEEE Magnetics Summer School” 9-16 June 2013, Assisi, Italy.
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## Grants and Fellowships

- Title:** Ultrafast Raman Technologies for Protein Identification and Sequencing. **Funding Organization:** European Union under the Call H2020-FETOPEN-2018-2019-2020-01. **Type:** Grant. **Coordinator:** Italian Institute of Technology. **Role:** Partner (local coordinator). **Date:** 2021-2024. **Total funding:** 3 M€. **Funding to the University of Luxembourg:** 600 k€.
- Title:** Ultrafast coherent hybridization of photons and spins in multi-functional magnetoplasmonic metamaterials. **Funding Organization:** Luxembourg National Research Fund (FNR). **Type:** Grant. **Coordinator:** University of Luxembourg. **Role:** Coordinator. **Principal Investigator:** Nicolò Maccaferri. **Date:** 2020-2022. **Total funding:** 430 k€. **Funding to the University of Luxembourg:** 430 k€.

3. **Title:** Magneto-optical activity in spatially confined geometries. **Funding Organization:** Basque Government. **Type:** Fellowship. **Coordinator:** CIC nanoGUNE. **Role:** Coordinator. **Principal Investigator:** Nicolò Maccaferri. **Date:** 2014-2016. **Total funding:** 45 k€. **Funding to CIC nanoGUNE:** 45 k€.
4. **Title:** Nanofabrication of plasmonic heterostructures for nanoscale light polarization manipulation. **Funding Organization:** Basque Government. **Type:** Grant. **Principal Investigator:** Nicolò Maccaferri. **Date:** 2015. **Total funding:** 3 k€.

In addition, during my postdoctoral experiences I have been involved as collaborator in prestigious European Projects, in particular one FET Open (PROSEQO, 2017-2019) and two ERC projects (NEUROPLASMONICS, 2014-2018 at IIT, and UpTEMPO, 2019-2024 at the University of Luxembourg).

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### Synergistic activities

- Co-founder and Communication Officer of the EPS Young Minds Luxembourg Chapter.
- Former Chair (from 01/2019 to 12/2020) of the Early Career Editorial Board of Nano Letters (American Chemical Society) and currently member (until 12/2021). Main activities: co-managing social network activities, writing blogs in ACS Axial and editorials, helping in the organization of the Nanoscience Global Lectures.
- Guest Editor of the Special Issue "Modern magnetophotonic materials and applications" in *Optical Materials Express*.
- Co-editor of the Special Issue "Advances in Nanopore Technology" in *Frontiers in Nanotechnologies*.
- Chair of the Special Session "Light-matter interactions in new materials and meta-architectures" at "META20 – 11th International Conference on Metamaterials, Photonic Crystals and Plasmonics" (July 20-23 2021, Warsaw, Poland) in collaboration with Dr. Vincenzo Caligiuri (University of Calabria and Italian Institute of Technology, Italy) and Prof. Mario Miscuglio (George Washington University, USA).
- Chair of the Special Session "Dynamic Metamaterials" at "META19 – 10th International Conference on Metamaterials, Photonic Crystals and Plasmonics" (July 23-26 2019, Lisbon, Portugal) in collaboration with Prof. Alexandre Dmitriev (University of Gothenburg, Sweden) and Prof. Paolo Vavassori (CIC nanoGUNE, Spain).
- Evaluator for the Polish National Science Academy for the Funding Scheme OPUS-18, Panel ST3 (Condensed Matter Physics) and for PRACE (Partnership for Advanced Computing in Europe) for the "Call 20 of PRACE Project Access".
- Member of the Scientific Committee of the "School of Photonics: Plasmonics and Nano-Optics", organized every two years by the Italian Optics and Photonics Community (Plasmonics Division).
- Editorial Board Member, *Frontiers in Nanotechnology* (Nanomaterials Division) and *Frontiers in Physics* (Condensed Matter Physics Division).
- Regular Member of the OSA, EPS and ACS.
- Since September 2019 Inter-academic staff (post)docs representative in the Faculty Council (Faculty of Science, Technology and Medicine, University of Luxembourg).

- Reviewer for many peer-reviewed journals in Physics, Optics and Materials Science, including *Physical Review Letters*, *Advanced Materials*, *Optics Letters* and *Nano Letters*.
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## Research integrity

Since January 2019, I have been an actively a pro-bono consultant and a research integrity adviser for the Luxembourg Agency for Research Integrity and contact point at the University of Luxembourg to promote responsible and robust research conduct by using an innovative and proactive approach that blends education and creative sessions, coaching, and consultation to foster research integrity as a value that is built into research. The work of our team has been highlighted recently in *Nature* **586**, 358-360 (2020) (more information at <https://doi.org/10.1038/d41586-020-02847-8>). More information about us can be found in the Supplementary Material of the aforementioned article (<https://media.nature.com/original/magazine-assets/d41586-020-02847-8/18465656>) or in our website (<https://lari.lu/lari-services/lari-peer-coaching/>). Recently, I have also started a new training to become a research integrity trainer in the framework of the European Project VIRTU2E (<https://cordis.europa.eu/project/id/787580>). This virtue-based ethics and integrity of research program is focused on training researchers in both academia and industry for upholding the principles and practices of the European Code of Conduct for Research Integrity.

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## Outreach activities

To engage with society and grab attention to our research, I was a speaker at the TEDxUniversityofLuxembourg event in October 2019, giving a talk entitled “Metamaterials matter: new possibilities with the smart materials of the future” (<https://www.youtube.com/watch?v=FAF9EJJ9Xm8>). I am also involved in dissemination activities targeting the general public (from kids to elder people) with international philanthropist service organizations (e.g. Lions Club International) and with the “Scienteens Lab” ([https://www.uni.lu/lcsb/scienteens\\_lab](https://www.uni.lu/lcsb/scienteens_lab)) at the University of Luxembourg to develop outreach activities in Optics and Photonics for mid- and high- school students. I am also part of the initiative “Chercheurs à l’école”, where researchers of all scientific disciplines interact with high-school students about their life as researchers (from their beginnings as students, to their motivation for one or the other scientific discipline, first steps in their professional lives, career challenges and opportunities). In this way, we aim to give to teenagers the perfect opportunity to ask us all the questions they have and receive information on the advantages and the possible disadvantages of being a scientist. In 2019, I had also the possibility to participate in the “Evidence Matters” initiative (<https://www.fnr.lu/how-evidence-should-be-used-in-the-political-decision-making-process/>) organized by the Luxembourg National Research Fund, where researchers and civil society were brought together to discuss the role of science and evidence in politics. The overall aim of this initiative was to create a “draft of expectations” about how the European Parliament should use and scrutinize scientific evidence before taking decisions which have a direct impact on our welfare. The document was intended to serve as a mandate for the Members of the European Parliament to not only encourage them to use scientific evidence in their decision-making and how this can be done, but also to ensure that they communicate how and which evidence they use as a basis for their voting and political decisions.