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Giuseppe Maria Paternò

CURRICULUM VITAE

INFORMAZIONI PERSONALI

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Education

10/2011 – 07/2015: PhD in Physics at University College London

Thesis: Nanoscale Characterisation and Neutron Damage Testing of Organic semiconductors

Supervisors: Prof. Franco Cacialli and Dr. Victoria Garcia Sakai

(f.cacialli@ucl.ac.uk ; victoria.garcia-sakai@stfc.ac.uk)**10/2009-07/2011:** Master's degree in Chemistry of Materials at University of Catania (Italy).

Marks: 110/110 cum laude

Thesis: Crystallization processes of polymers confined in ultrathin film

Supervisor: Prof. Giovanni Marletta (gmarletta@unict.it)**10/2006-10/2009:** Bachelor's degree in Chemistry at University of Catania (Italy)

Marks: 110/110 cum laude

Thesis: Self-organization processes of conjugated copolymers Langmuir's films

Supervisor: Prof. Giovanni Marletta

Research Experience

07/2018 - present: Post-Doctoral fellow at the Italian Institute of Technology, Center for Nanoscience and Technology.

Coordinator of the Italian national project "Low-cost and reusable photonic crystals for optical detection of bacterial contaminants" (Fondazione Cariplo –Economia Circolare, 2019-2022);

Main Projects: Spectroscopy of organic conjugated materials for non-genetic optical control of bio-targets, including living eukaryotic cells and bacteria; Photonics for bio-sensing.

07/2015 – 06/2018: Marie Curie Fellow - Early stage researcher at the Italian Institute of Technology, Center for Nanoscience and Technology.

Main Projects: Spectroscopy of functional materials, including low-dimensionality materials for electronics, energy and bio-applications. Fabrication and characterization of photonic devices for light manipulation.

10/2011 – 07/2015: PhD research activity at UCL and ISIS – Neutron and Muon Source (UK)

Main projects: Nanoscale characterization of polymer semiconductors for organic photovoltaics by means of x-ray and neutron scattering techniques; fabrication and characterization of organic solar cells and transistors; effect of fast neutron radiation exposure on polymer semiconductors and related optoelectronic devices, for space and avionic applications.

10/2010 – 07/2011: Research Internship at the Laboratory for Molecular Surfaces and Nanotechnology (LAMSun) at the Department of Chemistry of University of Catania.

Project: Study of the influence of substrates wettability and film thickness on the crystallization phenomena of poly (3-hexylthiophene) for photovoltaic applications. Structural and morphological characterizations carried out by means of x-rays diffraction, reflectivity and atomic force microscopy.

Publications

- (1) Paternò, G.; Warren, A. J.; Spencer, J.; Evans, G.; Sakai, V. G.; Blumberger, J.; Cacialli, F. Micro-Focused X-Ray Diffraction Characterization of High-Quality [6,6]-Phenyl-C61-Butyric Acid Methyl Ester Single Crystals without Solvent Impurities. *J. Mater. Chem. C* **2013**, *1* (36), 5619–5623. <https://doi.org/10.1039/c3tc31075b>.
- (2) Paternò, G.; Cacialli, F.; García-Sakai, V. Structural and Dynamical Characterization of P3HT/PCBM Blends. *Chem. Phys.* **2013**, *427*, 142–146. <https://doi.org/10.1016/j.chemphys.2013.10.006>.
- (3) Tregnago, G.; Wykes, M.; Paternò, G. M.; Beljonne, D.; Cacialli, F. Low-Temperature Photoluminescence Spectroscopy of Solvent-Free PCBM Single-Crystals. *J. Phys. Chem. C* **2015**, *119* (21), 11846–11851. <https://doi.org/10.1021/acs.jpcc.5b02345>.
- (4) Eperon, G. E.; Paternò, G. M.; Sutton, R. J.; Zampetti, A.; Haghighirad, A. A.; Cacialli, F.; Snaith, H. J. Inorganic Caesium Lead Iodide Perovskite Solar Cells. *J. Mater. Chem. A* **2015**, *3* (39), 19688–19695. <https://doi.org/10.1039/c5ta06398a>.
- (5) Lazzerini, G. M.; Paternò, G. M.; Tregnago, G.; Treat, N.; Stingelin, N.; Yacoot, A.; Cacialli, F. Traceable Atomic Force Microscopy of High-Quality Solvent-Free Crystals of [6,6]-Phenyl-C61-Butyric Acid Methyl Ester. *Appl. Phys. Lett.* **2016**, *108* (5), 053303. <https://doi.org/10.1063/1.4941227>.
- (6) Paternò, G. M.; Skoda, M. W. A.; Dalgliesh, R.; Cacialli, F.; García Sakai, V. Tuning Fullerene Intercalation in a Poly (Thiophene) Derivative by Controlling the Polymer Degree of Self-Organisation. *Sci. Rep.* **2016**, *6* (1), 34609. <https://doi.org/10.1038/srep34609>.
- (7) Paternò, G. M.; Stewart, J. R.; Wildes, A.; Cacialli, F.; Sakai, V. G. Neutron Polarisation Analysis of Polymer:Fullerene Blends for Organic Photovoltaics. *Polymer (Guildf)*. **2016**, *105*, 407–413. <https://doi.org/10.1016/j.polymer.2016.07.079>.
- (8) Paternò, G. M.; Galliano, S.; Barbero, N.; Barolo, C.; Borrelli, R.; Lanzani, G.; Scotognella, F. Spectroscopic Investigation of Squaraine Dyes. In *Organic Photonic Materials and Devices XIX*; Tabor, C. E., Kajzar, F., Kaino, T., Koike, Y., Eds.; 2017; Vol. 10101, p 101010R. <https://doi.org/10.1117/12.2251335>.
- (9) Paternò, G. M.; Moretti, L.; Barker, A. J.; D'Andrea, C.; Luzio, A.; Barbero, N.; Galliano, S.; Barolo, C.; Lanzani, G.; Scotognella, F. Near-Infrared Emitting Single Squaraine Dye Aggregates with Large Stokes Shifts. *J. Mater. Chem. C* **2017**, *5* (31), 7732–7738.

<https://doi.org/10.1039/c7tc01375b>.

- (10) Paternò, G. M.; Chen, Q.; Wang, X. Y.; Liu, J.; Motti, S. G.; Petrozza, A.; Feng, X.; Lanzani, G.; Müllen, K.; Narita, A.; et al. Synthesis of Dibenzo[Hi,St]Ovalene and Its Amplified Spontaneous Emission in a Polystyrene Matrix. *Angew. Chemie - Int. Ed.* **2017**, *56* (24), 6753–6757. <https://doi.org/10.1002/anie.201700730>.
- (11) Paternò, G. M.; Robbiano, V.; Fraser, K. J.; Frost, C.; García Sakai, V.; Cacialli, F. Neutron Radiation Tolerance of Two Benchmark Thiophene-Based Conjugated Polymers: The Importance of Crystallinity for Organic Avionics. *Sci. Rep.* **2017**, *7* (1), 41013. <https://doi.org/10.1038/srep41013>.
- (12) Robbiano, V.; Paternò, G. M.; La Mattina, A. A.; Motti, S. G.; Lanzani, G.; Scotognella, F.; Barillaro, G. Room-Temperature Low-Threshold Lasing from Monolithically Integrated Nanostructured Porous Silicon Hybrid Microcavities. *ACS Nano* **2018**, *12* (5), 4536–4544. <https://doi.org/10.1021/acsnano.8b00875>.
- (13) Paternò, G. M.; Barbero, N.; Galliano, S.; Barolo, C.; Lanzani, G.; Scotognella, F.; Borrelli, R. Excited State Photophysics of Squaraine Dyes for Photovoltaic Applications: An Alternative Deactivation Scenario. *J. Mater. Chem. C* **2018**, *6* (11), 2778–2785. <https://doi.org/10.1039/c7tc05078j>.
- (14) Robbiano, V.; Paternò, G. M.; Cotella, G. F.; Fiore, T.; Dianetti, M.; Scopelliti, M.; Brunetti, F.; Pignataro, B.; Cacialli, F. Polystyrene Nanoparticle-Templated Hollow Titania Nanosphere Monolayers as Ordered Scaffolds. *J. Mater. Chem. C* **2018**, *6* (10), 2502–2508. <https://doi.org/10.1039/c7tc04070a>.
- (15) Paternò, G. M.; Moscardi, L.; Kriegel, I.; Scotognella, F.; Lanzani, G. Electro-Optic and Magneto-Optic Photonic Devices Based on Multilayer Photonic Structures. *J. Photonics Energy* **2018**, *8* (03), 1. <https://doi.org/10.1117/1.jpe.8.032201>.
- (16) Paternò, G. M.; Nicoli, L.; Chen, Q.; Müllen, K.; Narita, A.; Lanzani, G.; Scotognella, F. Modulation of the Nonlinear Optical Properties of Dibenzo[Hi, St]Ovalene by Peripheral Substituents. *J. Phys. Chem. C* **2018**, *122* (43), 25007–25013. <https://doi.org/10.1021/acs.jpcc.8b06536>.
- (17) Paternò, G. M.; Iseppon, C.; D’Altri, A.; Fasanotti, C.; Merati, G.; Randi, M.; Desii, A.; Pogna, E. A. A.; Viola, D.; Cerullo, G.; et al. Solution Processable and Optically Switchable 1D Photonic Structures. *Sci. Rep.* **2018**, *8* (1), 3517. <https://doi.org/10.1038/s41598-018-21824-w>.
- (18) Paternò, G. M.; Robbiano, V.; Santarelli, L.; Zampetti, A.; Cazzaniga, C.; García Sakai, V.; Cacialli, F. Perovskite Solar Cell Resilience to Fast Neutrons. *Sustain. Energy Fuels* **2019**, *3* (10), 2561–2566. <https://doi.org/10.1039/c9se00102f>.
- (19) Figueroa Del Valle, D. G.; Paternò, G. M.; Farina, A.; Scotognella, F. Semiconducting Carbon Nanotubes in Photovoltaic Blends: The Case of PTB7:PC 60 BM:(6,5) SWNT. *J. Appl. Phys.* **2019**, *125* (8), 083101. <https://doi.org/10.1063/1.5086504>.
- (20) Yao, X.; Wang, X. Y.; Simpson, C.; Paternò, G. M.; Guizzardi, M.; Wagner, M.; Cerullo, G.; Scotognella, F.; Watson, M. D.; Narita, A.; et al. Regioselective Hydrogenation of a 60-Carbon Nanographene Molecule toward a Circumbiphenyl Core. *J. Am. Chem. Soc.* **2019**, *141* (10), 4230–4234. <https://doi.org/10.1021/jacs.9b00384>.
- (21) Lova, P.; Giusto, P.; Di Stasio, F.; Manfredi, G.; Paternò, G. M.; Cortecchia, D.; Soci, C.; Comoretto, D. All-Polymer Methylammonium Lead Iodide Perovskite Microcavities. *Nanoscale* **2019**, *11* (18), 8978–8983. <https://doi.org/10.1039/c9nr01422e>.
- (22) Paternò, G. M.; Mishra, N.; Barker, A. J.; Dang, Z.; Lanzani, G.; Manna, L.; Petrozza, A. Broadband Defects Emission and Enhanced Ligand Raman Scattering in 0D Cs₃Bi₂I₉ Colloidal Nanocrystals. *Adv. Funct. Mater.* **2019**, *29* (21), 1805299. <https://doi.org/10.1002/adfm.201805299>.
- (23) Paternò, G. M.; Moretti, L.; Barker, A. J.; Chen, Q.; Müllen, K.; Narita, A.; Cerullo, G.; Scotognella, F.; Lanzani, G. Pump–Push–Probe for Ultrafast All-Optical Switching: The

Case of a Nanographene Molecule. *Adv. Funct. Mater.* **2019**, 29 (21), 1805249. <https://doi.org/10.1002/adfm.201805249>.

- (24) Hu, Y.; Paternò, G. M.; Wang, X. Y.; Wang, X. C.; Guizzardi, M.; Chen, Q.; Schollmeyer, D.; Cao, X. Y.; Cerullo, G.; Scotognella, F.; et al. π -Extended Pyrene-Fused Double [7]Carbohelicene as a Chiral Polycyclic Aromatic Hydrocarbon. *J. Am. Chem. Soc.* **2019**, 141 (32), 12797–12803. <https://doi.org/10.1021/jacs.9b05610>.
- (25) Paternò, G. M.; Moscardi, L.; Donini, S.; Ariodanti, D.; Kriegel, I.; Zani, M.; Parisini, E.; Scotognella, F.; Lanzani, G. Hybrid One-Dimensional Plasmonic-Photonic Crystals for Optical Detection of Bacterial Contaminants. *J. Phys. Chem. Lett.* **2019**, 10 (17), 4980–4986. <https://doi.org/10.1021/acs.jpcllett.9b01612>.
- (26) Cassella, G.; Stewart, J. R.; Paternò, G. M.; García Sakai, V.; Devonport, M.; Galsworthy, P. J.; Bewley, R. I.; Voneshen, D. J.; Raspino, D.; Nilsen, G. J. Polarization Analysis on the LET Cold Neutron Spectrometer Using a 3 He Spin-Filter: First Results. *J. Phys. Conf. Ser.* **2019**, 1316 (1), 012007. <https://doi.org/10.1088/1742-6596/1316/1/012007>.
- (27) DiFrancesco, M. L.; Lodola, F.; Colombo, E.; Maragliano, L.; Bramini, M.; Paternò, G. M.; Baldelli, P.; Serra, M. D.; Lunelli, L.; Marchioretto, M.; et al. Neuronal Firing Modulation by a Membrane-Targeted Photoswitch. *Nat. Nanotechnol.* **2020**. <https://doi.org/10.1038/s41565-019-0632-6>.
- (28) Paternò, G. M.; Colombo, E.; Vurro, V.; Lodola, F.; Cimò, S.; Sesti, V.; Molotokaite, E.; Bramini, M.; Ganzer, L.; Fazzi, D.; et al. Membrane Environment Enables Ultrafast Isomerization of Amphiphilic Azobenzene. *Adv. Sci.* **2020**, 1903241, 1903241. <https://doi.org/10.1002/advs.201903241>.
- (29) Paterno, G. M.; Moscardi, L.; Donini, S.; Ross, A. M.; Pietralunga, S. M.; Dalla Vedova, N.; Normani, S.; Kriegel, I.; Lanzani, G.; Scotognella, F. INTEGRATION OF BIO-RESPONSIVE SILVER IN 1D PHOTONIC CRYSTALS: TOWARDS THE COLORIMETRIC DETECTION OF BACTERIA. *Faraday Discuss.* **2020**. <https://doi.org/10.1039/D0FD00026D>.

Patent

C. Bertarelli, L. Colella, F. Benfenati, M. Di Francesco, E. Colombo, F. Lodola, G.M. Paternò, J. Fernando Maya-Vetencourt, G. Lanzani, PHOTOCHROMIC COMPOUNDS FOR USE IN THE TREATMENT OF EYE DISORDERS, <http://hdl.handle.net/11311/1131519>.

Reviewer activity

Referee for 11 manuscripts sent for publications in: Optical Materials (1); Applied Physics Reviews (1); Computational and Theoretical Chemistry (2); Scientific Reports (2); Luminescence: the Journal of Biological and Chemical Luminescence (1); Physica Status Solidi (B) (1); Journal of Materials Chemistry C (1); Nature Communications (1); Journal of Polymer Science Part B: Polymer Physics (1).

Invited and contributed presentations

1. *Ultrafast Spectroscopic Investigations and Amplified Spontaneous Emission of Nanographene*, Workshop on photophysics and nanomaterials (WONPHYS), Varadero (Cuba) 26/09/2017
2. *Hybrid Plasmonic/Photonic Crystals for Optical Detection of Bacterial Contaminants*, Photonics & Electromagnetics Research Symposium (PIERS), Rome, Italy, 17-20 June, 2019;
3. *Organic light actuators for non-genetic optical stimulation*, Optical Society (OSA) Advanced Photonics 2019, San Francisco, USA July 29, - August 1, 2019;

> 20 contributed oral and >10 poster presentations in international conferences

Teaching

1. General Physics course at Politecnico di Milano (Prof. C. D'Andrea)- Teaching assistant (A.A. 2016/2017 and 2017/2018);
2. Plastic and Molecular Electronics course at University College London (Prof. F. Cacialli) – Exams marker (2015);
3. Teaching assistant for general Chemistry laboratory (A.A. 2010/2011).

Mentoring experience

1. Yuan Deng, Msci. Physics and Astronomy, Department of Physics University College London, *Growth and characterisation of single crystals of fullerene derivatives*, London 03/2014;
2. Jens Tiebert, Msci. Physics and Astronomy, Department of Physics University College London, *Growth and characterisation of single crystals of organic semiconductors*, London, 09/2014;
3. Daniel Martino Martinez. Msci. Physics and Astronomy, Department of Physics University College London, *Growth and characterisation of single crystals of fullerene derivatives*, London 03/2015;
4. Luca Nicoli, Bachelor's degree project, Physical Engineering, Department of Physics, Politecnico di Milano, *The role of functionalization in the nonlinear optical properties in nanographene: the case of dibenzoovalene*, Milan 09/2017;
5. Giordano Zannini, Bachelor's degree project, Physical Engineering, Department of Physics Politecnico di Milano, Spectroscopic investigation of an azobenzene molecule for biological applications, Milan 09/2017;
6. Liliana Moscardi, Master's degree project, Materials Engineering, Department of Chemistry, Chemical Engineering and Materials Engineering "Giulio Natta", Fabrication, characterization and electric doping of ITO-TiO₂ and ITO-SiO₂ photonic crystals, Milan 10/2018
7. Arianna Magni, Master's degree project, Engineering physics, Department of Physics, Politecnico di Milano, *Amphiphilic Azobenzene for phase recognition in model membranes*, Milan 12/2019.

Grants and proposals

- CARIPLO, Economia Circolare - 2019-2022. "Low-cost and reusable photonic crystals for optical detection of bacterial contaminants", grant n° 2018-0979. Coordinator and Principal Investigator. 300k €;
- Industrial Project with CENTRO GRAFICO DG - 2020-2023. "Photonic crystals for optical detection of bacterial contaminants". Coordinator and Principal Investigator. 400k €. Within this project, I supervise 1 fellow and 1 Post-doctoral researcher;
- Marie Curie Fellow – Early Stage Researcher – 2015-2018. Initial training network (ITN) SYNCHRONICS Grant Agreement N. 643238
- 5 proposals founded by ISIS – Neutron and Muon Source (Harwell Campus, UK), for the nanoscale investigation of organic semiconductors for photovoltaics by using neutron spectroscopy, and for testing the resilience against fast neutrons for space and avionic applications;
- 2 proposals founded by Institut Laue-Langevin (ILL, Grenoble) for studying the molecular spectroscopy of polymer semiconductors for organic optoelectronics via neutron scattering;
- 1 proposal founded by Diamond Light Source (Harwell Campus, UK) for carrying out micro-focused x-ray diffraction on single crystals of fullerene derivatives.

Awards and organizations

- Poster prize at the UK Neutron and Muon Users Meeting (April 2014);
Poster title: Neutron Radiation Tolerance of Organic Field-Effect Transistors
- Poster prize at the UK Neutron and Muon Users Meeting (April 2015);
Poster title: Neutron Radiation Tolerance of Organic Solar Cells
- Member of the Materials Research Society (MRS). 2019 - present.

Language skills

Mother tongue: **Italian**

Other language: **English - Full professional proficiency (level group C2)**

Certification: English for academic purposes (EAP) course, University College London (03/2012)

Personal Interests

Piano and classical music; History; Sport (running and football).

References

- Prof. Guglielmo Lanzani,
Full professor of Physics at Politecnico di Milano, Director of the Center for Nanoscience and Technology at the Italian Institute of Technology
Email: Guglielmo.lanzani@iit.it
- Prof. Franco Cacialli
Full professor of Physics at University College London and at the London Centre for Nanotechnology (LCN)
Royal Society, Wolfson Research Merit Award (2015-2019)
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- Dr. Victoria Garcia Sakai
Molecular Spectroscopy Group Leader at ISIS Pulsed Neutron and Muon Facility, Science and Technology Facilities Council (STFC), Rutherford Appleton Laboratory
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- Prof. Giovanni Marletta
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Data

07/04/2020

Luogo

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