

# Simone De Camillis



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## Professional Experience

### Senior Optical Specialist / Research Fellow

Jan 2021 – Present

Australian National University (Supervisor: Prof. Adrian Sheppard)



- Developed interferometric-based optical systems for volumetric imaging of crystals and detection of defects/inclusions.
- Re-designed and manufactured the optical interferometer unit integrated in the first generation of the HyperScan machines, delivering improved optical stability and image quality.
- Modelled imaging errors caused by opto-mechanical distortions and environmental instabilities. Developed suitable correction algorithms and standard calibration procedures.
- Supported optimisation and maintenance of the HyperScan machines deployed overseas.
- Coordinated the optomechanical R&D projects and ensured alignment with all the stakeholders.

### Research Fellow

Jan 2019 – Jan 2021

Macquarie University (Supervisor: Em. Prof. Jim Piper)

ARC Centre of Excellence for Nanoscale BioPhotonics ([cnblegacy.org.au/imaging](http://cnblegacy.org.au/imaging))



- Led experimental projects to develop novel super-resolution imaging techniques and enabled advances in fluorescent nanoprobe and biomedical imaging.
- Developed, operated, and maintained a table-top free-space confocal microscope, including a co-propagating excitation beam with a ring-shaped intensity profile for super-resolution applications.
- Performed numerical studies on the feasibility of Non-Linear Structured Illumination Microscopy (NL-SIM) for the detection of up-conversion nanoparticles. I successfully implemented the NL-SIM algorithm to a different class of non-linear emitters to reconstruct information at high spatial frequencies.

### Instrumentation Engineer

Jan 2018 – Dec 2018

CEA Centre, Paris-Saclay, France (Supervisor: Dr. Olivier Boulade)



- Characterisation of matrix detectors in the VIS-LWIR for spatial and astrophysical applications.
- Developed a centralised control software to operate the cryostat, the vacuum system, and the data acquisition.
- Conceptualised and implemented numerical simulations of the illumination pattern detected at the focal plane to evaluate hardware performance.

### R&D Engineer

Jan 2017 – Dec 2017

General Electric - Grid Solutions, Lisburn, UK (Supervisor: Dr. Chris Calvert)



- Assessed the applicability of novel electro-optical solutions for gas detection and the integration to existing GE products.
  - Responsible for the experiments, data analysis and the development of theoretical models.
- Developed and implemented a correction algorithm based on field data to extend the accuracy and lifetime of gas sensing detectors.

## Skills

- Leadership**
- Coordinator of the R&D optical projects for the commercial project SmartLight.
  - Management of the SmartLight optical laboratories.
  - Head researcher for projects on microscopy (Macquarie) and spectroscopy (QUB).
  - Representative of early career researchers within the CNBP Centre of Excellence.
- Instrumentation**
- Free-space optics, pump-probe optical setup, mode-locked femtosecond pulsed lasers, harmonic generation, attosecond science.
  - Fibre fusion splicing, fibre-based interferometers, optical coherent tomography.
  - Confocal microscopy, structured illumination and super-resolution imaging.
  - Analog and digital electronic instrumentation for automated control, synchronised acquisition, and advanced architecture design.
  - Developing and operating high-vacuum and cryogenic systems.
- Programming**
- Optical design: OpticStudio Zemax.
  - Control software: LabVIEW.
  - Simulations and data analysis: Phyton, MATLAB, C, Fortran.
  - Image processing: Phyton, ImageJ, Paraview.
  - Mechanical design: SolidEdge, SolidWorks.
  - Drawings: Inkscape, Blender.
- Communication**
- 15 peer-reviewed papers published in international journals (see ORCID profile)
  - 6 talk/poster presentations at international conferences.
  - Teaching the postgraduate class Advanced Imaging Methods and Systems (PHYS8721, ANU, 2021-2023).
  - Planning and reporting R&D work on Confluence and Jira.

## Training and Schools

- Feb-Apr 2024 **Online courses of “Optical Efficiency and Resolution” and “Design of High-Performance Optical Systems”** delivered by the University of Colorado Boulder via Coursera.
- Jun 2018 **School on visible and IR detection** at the Observatoire de Haute Provence, France. Instrumentation, detectors and data analysis for Astronomy and Astrophysics.
- Mar 2018 **Python programming** delivered by Styrel, France.
- Jan-Apr 2016 **Visiting Researcher** at the Institute of Photonics and Nanotechnologies, Milan, Italy  
Project: “Ultrashort UV pulse production for next-generation pump-probe measurements”.
- Jul-Aug 2013 **PRACE Summer of High-Performance Computing (SoHPC)** at the University of Edinburgh, UK.  
Project: 3D visualisations in Paraview with the computational power of supercomputers.

## Grants and Awards

- Jan 2020 **Collaborative Seed grant** from Biophotonics Career Workshop at Swinburne University of Technology (AUD 2,500).
- Nov 2020 **Postdoctoral Fellowship** from CNBP Centre of Excellence at Macquarie University.
- Sep 2015 **Short-term Scientific Mission grant** from European COST Action (~AUD 4,100).
- Jan 2015 **Travel grant** from European COST Action.
- Dec 2013 **Short-term Scientific Mission grant** from European COST Action (~AUD 4,000).

## Education

### Doctor of Philosophy (Ph.D.) in Optical Physics

Oct 2013 – June 2017

*School of Mathematics and Physics, Queen's University Belfast, UK (Supervisor: Dr. Jason Greenwood)*

Thesis: "Ultrafast Dynamics in Gas-Phase Building Blocks of Life"

([pure.qub.ac.uk/en/studentTheses/ultrafast-dynamics-in-gas-phase-building-blocks-of-life](http://pure.qub.ac.uk/en/studentTheses/ultrafast-dynamics-in-gas-phase-building-blocks-of-life))

### Laurea Magistrale (Master of Science) in Plasma and Condensed Matter Physics

Oct 2010 – July 2013

*University of Pisa, Italy (Supervisor: Prof. Francesco Califano)*

Thesis: "Fluid modelling of pressure anisotropy effects in a magnetized plasma" (Final mark: 110/110)

### Laurea Triennale (Bachelor of Science) in Physics

Oct 2008 – July 2010

*University of Pisa, Italy*

Final mark: 110/110 with honours

## Selected Publications

- S. De Camillis, P. Ren, Y. Cao, M. Ploschner *et al.* "Controlling the non-linear emission of upconversion nanoparticles to enhance super-resolution imaging performance", [Nanoscale 12, 20347 \(2020\)](#)
- M. Ploschner, D. Denkova, S. De Camillis *at al.* "Simultaneous super-linear excitation-emission and emission depletion allows imaging of upconversion nanoparticles with higher sub-diffraction resolution", [Optical express 28, 24308 \(2020\)](#)
- S. De Camillis, S.S. Cerri, F. Califano *et al.* "Pressure anisotropy generation in a magnetized plasma configuration with a shear flow velocity", [Plasma Physics and Controlled Fusion 58, 045007 \(2016\)](#)
- S. De Camillis, J. Miles, G. Alexander *et al.* "Ultrafast Non-Radiative Decay of Gas-Phase Nucleosides", [Physical Chemistry Chemical Physics 21, 23643 \(2015\)](#)
- J. Miles, S. De Camillis, G. Alexander *et al.* "Detection Limits of Organic Compounds Achievable with Intense, Short-Pulse Lasers", [Analyst 140, 4270-4276 \(2015\)](#)
- F. Calegari, D. Ayuso, A. Trabattoni, L. Belshaw, S. De Camillis *et al.* "Ultrafast Electron Dynamics in a Biomolecule Initiated by Attosecond Pulses", [Science 346, 336 \(2014\)](#)