

## Personal Details

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Date of birth: 10/07/1996  
Nationality: British, Italian

## Education and Training

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International Doctorate in Atomic and Molecular Photonics

October 2020-present

*European Laboratory of Non-Linear Spectroscopy*

Optics, customized Light Sheet microscopes, neuroscience, immunology, expansion microscopy, fluorescence microscopy, intact whole-brain imaging, neuron tracing.

### PhD Research Project

*European Laboratory for Non-Linear Spectroscopy (LENS), Florence*

The research centres around optimizing techniques in order to gain information of the neuronal anatomy of the mammalian brain.

As part of one project involved in the PhD work, a customized light sheet microscope has been developed that is capable of imaging large, intact samples. The light sheet will be able to identify and trace neuronal projections through the entire sample, useful for limiting the data field. The samples are prepared using an optimized Expansion Microscopy and labelling technique which will improve the resolution within the sample itself.

The other project that forms part of the PhD is the Human Brain project in which a customized inverted light sheet microscope is used to image cleared and labelled human brain slices. The microscope is optimized for this study in order to achieve the goals of resolution, imaging time and image quality.

Research Placement

February 2023-May

2023

*University of Bonn, Germany*

Optimization of various Expansion Microscopy techniques with immunolabelling for whole, intact mouse brains.

MSci (Hons) Physics with Medical Applications

2014-2018

With Second Class Honours, First Division (2:1)

*Queen's University Belfast*

Integrated BSci and MSci degree, General physics, Computational studies (Matlab, C++), Mathematics, Solid State physics, Astrophysics, Atomic and Nuclear physics, Electromagnetism, Optics, Particle physics, Physics in medicine, Laser physics, Plasma physics.

Some experiments completed during Bachelor's: Michelson Interferometer, Quartz Crystal Oscillator, Schmidt Plate, Zeeman Effect, Magnetostriction of Iron, X-ray Diffraction, Polarized Light.

During the Master's year, the project was completed in the Centre for Cancer Research and Cellular Biology. The title of the Masters project was 'Modelling tumour growth in murine models' in which a grade of a First was achieved.

Master's Project Research Project

2017-2018

First class grade

*Center for Cancer Research and Cell Biology, Belfast*

The project centred around the medical applications of Physics. The effects of radiation exposure on PTEN and PTEN-deficient lung cancer cells were computationally modelled using Matlab. For the *in vivo* studies, the human tumours had been implanted in murine models and underwent different treatment plans; including samples that were left untreated. The tumour growth rate was measured by measuring the tumour volume at various points throughout the treatment.

The same treatment plans were conducted on *in vitro* samples in which the same tumour cell lines were used. The proliferation of the cell colonies was counted in order to assess whether the effects of the physical dose deposition affected the growth rate and to compare the results with those of the *in vivo* study.

The study demonstrated the effects of gene mutilation, caused by cancer, in response to radiation which lead to inefficiencies for radiation-based treatments

## Conferences – Talks, posters and workshops

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### Oral presentation

Irene Constantini, Giacomo Mazzamuto, Niamh Brady, Mohamed Baghdad, Marina Scardigli, Filippo Castelli, Ludovico Silvestri, Francesco Pavone. "Reconstruction the Broca's area of the human brain using a customized dual-view light sheet for optimized imaging time and improved resolution". HBP Student Conference 2022

### Poster presentation

Irene Constantini, Giacomo Mazzamuto, Niamh Brady, Mohamed Baghdad, Marina Scardigli, Filippo Castelli, Ludovico Silvestri, Francesco Pavone. "Reconstruction the Broca's area of the human brain using a customized dual-view light sheet for optimized imaging time and improved resolution". HBP Student Conference 2022

Marina Scardigli, Irene Constantini, Niamh Brady, Mohamed Baghdad, Josephine Ramazzotti, Giacomo Mazzamuto, Filippo Casateli, Curzio Checcucci, Ludovico Silvestri, Paolo Frasconi, Francesco Pavoni. "3D molecular phenotyping of the human brain Broca's area using light-sheet fluorescece microscopy". SPIE Photonics Europe 2022

### Workshop conducted

Juan Rodrigues-Gatica, Niamh Brady. "Super resolution imaging achieved by specimen expansion and optical sectioning". TiM conference 2023

## Publications

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Marina Scardigli, Luca Pesce, Niamh Brady, Giacomo Mazzamuto, Vladislav Gavryusev, Ludovico Silvestri, Christophe Destrieux, Irene Constantitini, Francesco Pavone. "Comparison of Different Tissue Clearing Methods for Three-Dimensional Reconstruction of Human Brain Cellular Anatomy

Using Advanced Imaging Techniques”. *Front. Neuroanat.* 15:752234. doi: 10.3389/fnana.2021.752234

Luca Pesce, Marina Scardigli, Vladislav Gavryusev, Annunziata Laurino, Giacomo Mazzamuto, Niamh Brady, Giuseppe Sancataldo, Ludovico Silvestri, Christophe Destieux, Patrick R Hof, Irene Constantini, Francesco Pavone. “3D molecular phenotyping of cleared human brain tissues with light-sheet fluorescence microscopy”. *Communications Bio.* (2022) 5:447. doi: 10.1038/s42003-022-03390-0