

Marc Guillon

Born: 24/06/1979

Married, 4 children

Saints-Pères Paris Institute for Neurosciences (SPPIN)

CNRS UMR8003

University Paris Cité

75270 Paris Cedex 06

• EDUCATION

- 2015 **Venia Legendi**, (or “Habilitation”) diploma to supervise PhD student
Title: “super-resolution imaging in biological media”.
- 2007 **PhD in optomechanics** for astronomy instrumentation : Optical trapping and binding: feasibility study of a “laser trapped mirror”
Research performed at the Laboratory of Exoplanetary and Stellar Interferometry (FRE2215) headed by Pr. Antoine Labeyrie and hosted by the Haute-Provence Observatory (France).
Aix-Marseille University, Marseille, France
Advisor: Pr. Antoine Labeyrie
- 2004 **Master: Lasers and Matter**
University Paris XI, Orsay, France
- 2000-2004 **Ecole Normale Supérieure de Cachan**
- 2003 “**Agrégation**” passed, French competitive exam for teaching

• CURRENT POSITIONS

- 2021 – **PI of the “singular imaging group”** at Saint-Pères Paris Institute for the Neurosciences (SPPIN, CNRS UMR8003)
- 2019 – **Junior member of the *Institut Universitaire de France*** (Academic Institute of France). Selection by an international jury to distinguish university professors for their research excellence.
- 2008 – **Associate Professor (*Maître-de-Conférences*)**
Permanent researcher/professor university position with 192 hours of yearly teaching duties.
Current laboratory: Saints-Pères Paris Institute for Neurosciences
Until 2018: Research performed in the Wavefront Engineering Group (Headed by V. Emiliani) at the Neurophysiology and New Microscopy Laboratory and then at the Neurophotonics laboratory University Paris Descartes, Paris, France
- 2018 – **Visiting professor** at Laboratory Kastler Brossel in the group “optical imaging in biological and complex media” headed by Pr. Sylvain Gigan.
Ecole Normale Supérieure, Paris, France

• FELLOWSHIPS

- 2007 – 2008 **Postdoc**, University of Dundee, School of Engineering, Applied Physics Department, First working with Dr. D. McGloin and Pr. Kishan Dholakia on aerosol optical tweezing with a super-continuum laser source in the Optical Manipulation Group (St Andrews, UK); before Dr. McGloin found the Applied Optical Manipulation group at the university of Dundee where I studied thermo-optical multistability of optically tweezed droplets by stimulated Raman scattering. Dundee, UK

• TRACK RECORD

- 33 peer-reviewed publications including 20 as senior author and/or corresponding author
- 13 invitations in international conferences
- 949 citations, h-index: 18 (on 09/2022, source google scholar)

- **SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS**

- 2021 – Postdoc: Baptiste Blochet
ANR Project based on the wavefront sensor we developed in my group
Project: Compressed single-shot hyper-spectral wavefront sensing for
- 2019 – PhD: Payvand Arjmand
PI of the granted project about ultrafast compressed super-resolution microscopy.
- 2018 – 2021 Postdoc: Tengfei Wu
PI of the project granted by the technology transfer company (SATT – ERGANEQ)
Project: development of a high-resolution wavefront sensor
University of Paris, France
- 2014 – 2017 PhD: Marco Pascucci
PI of the granted project about super-resolution STED microscopy through multimode optical fibers.
University Paris Descartes, Paris, France
- 2011 – 2014 Postdoc: Marcel Lauterbach
PI of the first year granted project which allowed M. Lauterbach to successfully apply for a two-year Marie-Curie people program to combine super-resolution STED microscopy with computer generated holography to perform holographic photostimulation of dendritic spines with nanoscopic structural monitoring.
University Paris Descartes, Paris, France
- 2013 – 2016 participation to PhD supervision of Oscar Hernandez
University Paris Descartes, Paris, France
Currently: Postdoc with Mark Schnitzer at Stanford University
- 2014 – 2015 participation to PhD supervision of Osnath Assayag
Ecole supérieure de Physique et de Chimie Industrielle, Paris, France
Currently: Research engineer at intelligent imaging innovation (3i)
- 2010 – 2013 participation to PhD supervision of Clément Lafargue
Ecole normale supérieure de Cachan, Cachan, France
Currently : Assistant professor at Ecole Normale Supérieure, Cachan, France
- 2010 – 2019 Several Master students
from University Paris Descartes, Paris, France, or Institute of Optics Graduate School.

- **TEACHING ACTIVITIES**

- 2021 – **Advanced Imaging Techniques**, Master Biomedical Engineering, University Paris Cité
- 2016 – **Instrumentation in Nanophotonics** course, Master Erasmus Mundus “Monabiphot” headed by Ecole Normale Supérieure Paris Saclay.
- 2008 – Associate professor at university Paris Descartes – **General physics**, Optics, Mechanics, Microscopy, University Paris Descartes, Faculty of fundamental and biomedical sciences, Paris, France
Responsible for experimental works in physics in the BcS program of the

Biomedical institute (University Paris Descartes)

Typical examples of delivered lectures:

- Lecture of mathematics and physics for 1st year of the biomedical licence
- Lecture on introduction to wave optics and fluorescence microscopy to 3rd year of biomedical licence
- Lecture on super-resolution microscopy at Master degree level
- Practical works on microscopy to 3rd year of biomedical licence

2009, 2016 **Summer-schools** for the Erasmus Mundus Master program “Monabiphot” headed by ENS Paris Saclay

2004 – 2007 Teaching assistant at Aix-Marseille University – **General Physics**, Mechanics, Aix-Marseille University, Marseille, France

• INSTITUTIONAL RESPONSIBILITIES

2010 – 2018 Member of the international student programs office, University Paris Descartes, Paris, France

• COMMISSIONS OF TRUST

2020 – Elected at Scientific Advisory Board, University Paris Descartes, Paris, France

2016 – 2020 Elected at Scientific Advisory Board, University Paris Descartes, Paris, France

2012 – 2016 Elected at Scientific Advisory Board, University Paris Descartes, Paris, France

• GRANTS

2020 Collaborative grant from the French National Agency (ANR PRCE) MaxPhase Project: MaxPhase 630k€ including 210k€ for my group.

2018 two-year maturation completion project for technology transfer (SATT IdFInnov), 300k€. PI: M. Guillon & P. Berto

2018 Young researcher grant from the French National Agency (ANR JCJC), 300k€. Project: SpeckleSTED. PI: M. Guillon

2018 passed 1st step of the ERC consolidator grant

2014 Ile-de-France C’nano PhD funding 100k€. Project FiberSTED. PI: M. Guillon

2014 University funding 150k€. Project NanoBioSTED. PI: F. Montel (Univ. Diderot)

2010 Ile-de-France C’nano postdoc funding 50k€. Project Nanoscopy. PI: M. Guillon

Publications in preparation:

1. T. Wu, Y. Zhang, B. Blochet, P. Berto, **M. Guillon**, *Single-shot digital optical phase conjugation of fluorescent light through forward scattering media*, in prep.

Publications in peer-reviewed international journals:

- 33 peer-reviewed publications including 20 as senior author and/or corresponding author

- 949 citations, h-index: 18 (on 09/2022, source google scholar)

1. T. Wu, M. Guillon, C. Gentner, H. Rigneault, G. Tessier, P. Bon, and P. Berto, *3D nanoparticle superlocalization with a thin diffuser*, **Opt. Lett.** 47(12) 3079-3082 (2022)
2. L. Devaud, M. Guillon, I. Gusachenko, S. Gigan, *Chromato-axial memory effect in step-index multimode fibers*, **APL Photonics**, 6(12) 126105 (2021)
3. T. Wu, P. Berto, M. Guillon, *Reference-less complex wavefields characterization with a high-resolution wavefront sensor*, **Appl. Phys. Lett.** 118(25) 251102 (2021)

4. P. Arjmand, O. Katz, S. Gigan, M. Guillon, *Three-dimensional broadband light beam manipulation in forward scattering samples*, **Opt. Express**, 29 (5) 6563 (2021).
5. L. Zhu, J. Boutet de Monvel, P. Berto, S. Brasselet, S. Gigan, M. Guillon, *Chromato-axial memory effect of forward scattering media*, **Optica**, **7(4)** 338-345 (2020).
6. A. G. Vesga, M. Hofer, N.K. Balla, H.B. De Aguiar, M. Guillon, S. Brasselet, *Focusing large spectral bandwidths through scattering media*, **Opt. Express** **27**, 28384-28394 (2019)
7. J. Gateau, F. Claude, G. Tessier, M. Guillon, Topological transformations of speckles, **Optica** **6**, 914-920 (2019)
8. M. Pascucci, S. Ganesan, A. Tripathi, O. Katz, V. Emiliani, M. Guillon, *Compressive three-dimensional super-resolution microscopy with speckle-saturated fluorescence excitation*, **Nat. Commun.** **10(1)**, 1327 (2019)
9. C. Liu, P. Berto, S.I.F. Esparza, M. Guillon, G. Tessier, *Spatially and temporally reconfigurable temperature control at the microscale*, **ACS Photonics** **6** (2), 422 (2019).
10. P. Berto, M. Guillon, P. Bon, *Wrapping-free numerical refocusing of scalar electromagnetic fields*, **Appl. Opt.** **57(22)**, 6582-6586 (2018)
11. P. Berto, H. Rigneault, M. Guillon, *Wavefront sensing with a thin diffuser*, **Opt. Lett.** **42(24)** 5117-5120 (2017)
12. J. Gateau, H. Rigneault, M. Guillon, *Complementary speckle patterns: deterministic interchange of intrinsic vortices and maxima through scattering media*, **Phys. Rev. Lett.** **118**, 043903 (2017); (arXiv:1607.06722)
13. M. Guillon, B. Forget, A.J. Foust, V. De Sars, M. Ritsch-Marte, V. Emiliani, *Vortex-free phase profiles for uniform patterning with computer-generated holography*, **Opt. Express** **25(11)**, 12640-12652 (2017)
14. N. Michalski, J.D. Goutman, S.M. Auclair, J.B. de Monvel, M. Tertrais, A. Emptoz, A. Parrin, S. Nouaille, M. Guillon, M. Sachse, D. Ciric, A. Bahloul, J.P. Hardelin, R.B. Sutton, P. Avan, S.S. Krishnakumar, J.E. Rothman, D. Dulon, S. Safieddine, C. Petit, *Otoferrin acts as a Ca²⁺ sensor for vesicle fusion and vesicle pool replenishment at auditory hair cell ribbon synapses*, **eLife** **6e31013** (2017)
15. R. Conti, O. Assayag, V. de Sars, M. Guillon, V. Emiliani, *Computer generated holography with intensity-graded patterns*, **Front. Cell. Neurosci.** **10:236** (2016)
16. M. Lauterbach, M. Guillon, C. Desnos, D. Khamsing, Z. Jaffal, F. Darchen and V. Emiliani, *Superresolving dendritic spine morphology with STED microscopy under holographic photostimulation*, **Neurophotonics** **3(4)**, 041806 (2016)
17. M. Pascucci, G. Tessier, V. Emiliani, M. Guillon, *Super-resolution imaging of optical vortices in a speckle pattern*, **Phys. Rev. Lett.** **116**, 093904 (2016).
18. Ariadna Martinez-Marrades, Ph.D.; Léo Greusard; Yannick De Wilde; Natalie Bardou; Stéphane Collin; Marc Guillon; Gilles Tessier, *Characterization of plasmonic nanoantennas by Holographic Microscopy and Scanning Near-field Microscopy*, **Opt. Commun.** **359**, 455-459 (2016)
19. D. Li, K. Héroult, K. Zylbersztejn, M.A. Lauterbach, M. Guillon, M. Oheim, N. Ropert, *Astrocyte VAMP3 vesicles undergo Ca²⁺-independent cycling and modulate glutamate transporter trafficking*, **J. Physiol.** **593.13**, 2807–2832 (2015)
20. O. Hernandez, M. Guillon, E. Papagiakoumou, V. Emiliani, *Zero-order suppression for two-photon holographic excitation*, **Opt. Lett.** **39(20)**, 5953-5956 (2014)
21. M. Bretou, O. Jouannot, P. Pierobon, I. Fanget, N. Larochette, P. Gestraud, M. Guillon, V. Emiliani, S. Gasman, C. Desnos, A.-M. Lennon-Duménil and F. Darchen, *Cdc42 controls the dilation of the exocytotic fusion pore by regulating membrane tension*, **Mol Biol Cell**, E14-07-1229 (2014)

22. M. Guillon, M. A. Lauterbach, *quantitative confocal spiral phase contrast*, **J. Opt. Soc. Am. A** **31**(6), 1215-1225 (2014) selected for publication in the **Virtual Journal for Biomedical Optics** **9**(8), 1215 (2014)
23. M. A. Lauterbach, M. Guillon, A. Soltani, and V. Emiliani, *STED microscope with spiral phase contrast*, **Sci. Rep.** **3**, 2050 (2013)
24. E. Ronzitti, M. Guillon, V. de Sars, and V. Emiliani, *LCoS nematic SLM characterization and modeling for diffraction efficiency optimization, zero and ghost orders suppression*, **Opt. Exp.** **20** (16) 17843-17855 (2012)
25. S. Yang, E. Papagiakoumou, M. Guillon, V. de Sars, C.-M. Tang, and V. Emiliani. *Three-dimensional holographic photostimulation of the dendritic arbor*, **J. Neur. Eng.** **8**, 046002 (2011).
26. M. Guillon, R. Miles, J.P. Reid, D. McGloin, *Thermo-optical resonance locking of an optically trapped salt-water micro-droplet*, **New J. of Phys.** **11**, 103041 (2009)
27. R. Miles, M. Guillon, L. Mitchem, D. McGloin, J.P. Reid, *the influence of resonant absorption and heating on the equilibrium size of aqueous-solute aerosol droplet*, **Phys. Chem. Chem. Phys.** **11**, 7312 (2009)
28. M. Guillon, K. Dholakia, D. McGloin, *Optical trapping and spectral analysis of aerosols with a supercontinuum laser source*, **Opt. Exp.** **16**, 7655-7664 (2008).
29. M. Guillon, B. Stout, O. Moine, *Reply to comment*, **Phys. Rev. Lett.** **100**, 199404 (2008).
30. M. Guillon, B. Stout, *Optical trapping and binding in air: Imaging and spectroscopic analysis*, **Phys. Rev. A** **77**, 023806 (2008).
31. M. Guillon, O. Moine, B. Stout, *Erratum: Longitudinal optical binding of high contrast microdroplets in air*, **Phys. Rev. Lett.** **99**, 079901 (2007).
32. M. Guillon, O. Moine, B. Stout, *Longitudinal optical binding of high contrast microdroplets in air*, **Phys. Rev. Lett.** **96**, 143902: 1-4 (2006).
33. M. Guillon, *Field enhancement in a chain of optically bound dipoles*, **Opt. Exp.** **14**, 3045-3055 (2006).

Patents

- ANGULAR WAVEFRONT MULTIPLEXING – A METHOD FOR MEASURING SEVERAL WAVEFRONTS INCOMING FROM DIFFERENT INCLINATIONS, Marc Guillon, Pascal Berto, Gilles Tessier, Tengfei Wu, applied on Sept. 29th 2020.
- RECONSTRUCTION OF A WAVEFRONT OF A LIGHT BEAM CONTAINING OPTICAL VORTICES, Marc Guillon, Pascal Berto, EP20305898, applied on Aug. 4th, 2020.
- SINGLE-SHOT HYPERSPECTRAL WAVEFRONT SENSOR, Marc Guillon, Pascal Berto, Dimitris Papadopoulos, Gilles Tessier, EP19305382, WO2020/193032A1, 2019.
- OPTICAL SYSTEM COMPRISING A SPATIAL LIGHT MODULATOR, Marc Guillon, Eirini Papagiakoumou, Valentina Emiliani, EP14305253 EP14305253, submitted Feb. 24th, 2014, PCT EP2015/053855.
- MICROSCOPE FOR HIGH SPATIAL RESOLUTION IMAGING A STRUCTURE OF INTEREST IN A SAMPLE, Marc Guillon, Marcel Lauterbach, Valentina Emiliani, EP12305509, submitted May 7th, 2012, PCT EP2013059230, submitted May 3rd, 2013.

International conferences :

- M. Guillon, Phase Conjugation of Multiply Scattered Fluorescent Light with a Wavefront Sensor, Face2Phase3, Delft, The Netherlands (2022)
- M. Guillon, Digital optical phase conjugation through thick scattering tissues with a wavefront sensor, Photonics West, BIOS, USA (2022) (*Invited presentation*)
- M. Guillon, Manipulating critical points of random light for super-resolution microscopy, 5th International conference on angular angular momentum (ICOAM), Ottawa, Canada (2019) (*Invited presentation*)
- T. Wu, M. Guillon, H. Rigneault, G. Tessier, P. Bon, P. Berto, Wavefront Sensing with a thin diffuser: application to super-localization, Digital Holography and three-dimensional imaging MB5S, Bordeaux, France (2019)
- M. Pascucci, S. Ganesan, A. Tripathi, O. Katz, V. Emiliani, M. Guillon, Compressive 3D super-resolution imaging with speckles, French-Israel Symposium on Non-linear and Quantum Optics 15 (Frisno 15), Aussois, France (2019)
- P. Berto, T. Wu, H. Rigneault, M. Guillon, Wavefront sensing with a thin diffuser, French-Israel Symposium on Non-linear and Quantum Optics 15 (Frisno 15), Aussois, France (2019)
- M. Guillon, Using optical vortices in speckles for compressed 3D super-resolution imaging, Biophotonics and Optical Angular Momentum (BIOAM), Palaiseau, France (2018) (*Invited presentation*)
- S. Sivankutty, D. Kogan, V. Tsvirkun, G. Bouwmans, E.R. Andresen, M. Guillon, M. Alonso, D. Oron, H. Rigneault, Non-interferometric calibration of the phase transmission matrix in lensless endoscopy, SPIE BIOS, San Francisco, USA (2019)
- M. Guillon, Compressed three-dimensional imaging with speckles, EOSAM, Delft, Netherlands (2018) (*Invited presentation*)
- M. Pascucci, G. Tessier, V. Emiliani, M. Guillon, Sub-diffraction imaging of phase singularities in a high-NA speckle optical field, Conference on Lasers and Electro-Optics (CLEO) Europe, Munich, Germany (2017)
- J. Gateau, H. Rigneault, M. Guillon, Deterministic generation of complementary speckle patterns through scattering media, European Conference on Biomedical Optics (ECBO), Munich, Germany (2017)
- J. Gateau, H. Rigneault, M. Guillon, Deterministic generation of complementary speckle patterns through opaque media, French-Israel Symposium on Non-linear and Quantum Optics (Frisno 14), Ein Gedi, Israel (2017)
- M. Pascucci, V. Emiliani, M. Guillon, Super-resolution speckle imaging, French-Israel Symposium on Non-linear and Quantum Optics (Frisno 14), Ein Gedi, Israel (2017)
- M. Guillon, J. Gateau, M. Pascucci, H. Rigneault, V. Emiliani, Saturated Negatives of speckle patterns and Complementary speckle patterns for super-resolution imaging, Optics and Singularities (Optis), Cachan, France (2016) (*Invited presentation*)
- M. Guillon, J. Gateau, M. Pascucci, H. Rigneault, V. Emiliani, Saturated Negatives and Complementary speckle patterns, Biophotonics and Optical Angular Momentum (BIOAM), Palaiseau, France (2016) (*Invited presentation*)
- M. Guillon, J. Gateau, M. Pascucci, H. Rigneault, V. Emiliani, Super-resolution imaging of optical vortices in a high-NA speckle pattern, Computational Optical Sensing and Imaging (COSI), Heidelberg (2016) (*Invited presentation*)
- Marco Pascucci, Gilles Tessier, Valentina Emiliani, Marc Guillon, Super-resolution STED imaging of optical vortices in a high-NA speckle pattern, Brain In Focus conference, Rungstedgaard, Denmark (2016)

- M. Guillon, Optical field singularities for super-resolution imaging, BioNanoPhotonics conference, Cardiff, UK (2015) (**invited presentation**)
- M. Guillon, *Optical phase singularities and super-resolution imaging*, Games of Light with Meta-Molecules: Communicating, sensing and imaging, Cachan, France, (June 2015).
- Marco Pascucci, Marcel Lauterbach, Valentina Emiliani, Marc Guillon, Subdiffraction imaging of phase singularities in a high-NA speckle optical field, French-Israel Symposium on Non-linear and Quantum Optics 13 (Frisno 13), Aussois, France (2015)
- M. Guillon, M. Lauterbach, V. Emiliani, Quantitative confocal phase contrast imaging in a STED microscope, French-Israel Symposium on Non-linear and Quantum Optics 13 (Frisno 13), Aussois, France (2015)
- M. Lauterbach, M. Guillon, A. Soltani, V. Emiliani, *STED microscope with spiral phase contrast*, European Optical Society Annual Meeting, Paris, France, May 2014.
- M. Guillon, *Quantitative spiral phase contrast imaging in a stimulated emission depletion microscope*, International Conference on Optical Angular Momentum, Glasgow, June 2013. (**Invited presentation**)
- M. Guillon, M. Lauterbach, A. Soltani, V. Emiliani, *High sensitivity phase contrast Imaging in a Stimulated Emission Depletion Microscope*, European Conferences on Biomedical Optics, Munich, May 2013.
- M. Lauterbach, M. Guillon, A. Soltani, V. Emiliani, *STED microscope with phase contrast*, European Optical Society Annual Meeting, Aberdeen, Scotland, UK, 25-28 Sept. 2012.
- M. Lauterbach, M. Guillon, V. Emiliani, *STED microscope with phase contrast*, Annual meeting of the german biophysical society, Göttingen, Germany, 23-26 Sept. 2012.
- M. Guillon, *Optimization of nematic spatial light modulators for photo-activation of neurons*, SPIE Organic Photonics and Electronics, Liquid Crystals XVI, San Diego, Aug. 2012. (**Invited presentation**)
- M. Guillon, *Resonant locking of the size of an optically tweezed droplet*, Advances in Molecular Non-linear Optics AMARIS 10, Cachan, France, May 2010.
- D. McGloin, M. Guillon, D. Rudd, D.R. Brunham, M.D. Summers, J. Firmin, J.R. Butler, J.B. Willis, L. Mitchem, H. Meresman, J.P. Reid, A. Sheridan, *Towards airborne optofluidics*, International Symposium on Optomecatronic ISOT 2009, Istanbul, Turkey, Sept. 2009.
- M. Guillon, K. Dholakia, D. McGloin, *Aerosol tweezing with a super-continuum laser beam*, Proc. SPIE (Aug. 2008)
- M. Guillon, B. Stout (speaker), *Optical binding force characterization of double-droplet systems*, PIERS Beijing (Mars 2007). (**Invited presentation**)
- M. Guillon, *Optical trap shaping for binding force study and optimization*, SPIE Proceedings, San Jose **6483**, 648302 (Jan. 2007). (**Invited presentation**)
- M. Guillon, A. Labeyrie, B. Stout, *Optically bound double droplet microcavity*, E.O.S. Paris (Oct. 2006).
- M. Guillon, *Optical binding in air*, PIERS Proceedings, Cambridge, USA, 437-441 (Mars 2006). (**Invited presentation**)
- M. Guillon, *Optical trapping in rarefied media: towards laser-trapped space telescopes*, SPIE Proceedings **5930**, 593062 (Août 2005).
- A. Labeyrie, M. Guillon (speaker), J.-M. Fournier, *Optics of "Laser Trapped Mirrors" for large telescopes and hypertelescopes in space*, SPIE Proceedings **5899**, 589932 (Août 2005). (**Invited presentation**)