Dr. Matthew R. Foreman (last updated: January 1, 2017)

Personal Details

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Research Experience

Oct 2016 – present	**Royal Society University Research Fellow**, Photonics, Imperial College London, UK *"Dynamic plasmonic scattering"*
Jan 2015 – Sep 2016	**Max Planck Postdoctoral Researcher**, Max Planck Institute for the Science of Light, Germany (Supervisor: Prof. Gerd Leuchs) *"Anisotropic whispering-gallery mode resonators"*
Sep 2013 – Jan 2015	**Alexander von Humboldt Fellow**, Max Planck Institute for the Science of Light, Germany (Host: Dr. Frank Vollmer) *"Hybrid photonic-plasmonic micro-resonators for single molecule sensing"*
Oct 2012 – Sep 2013	**Max Planck Postdoctoral Researcher**, Max Planck Institute for the Science of Light, Germany (Supervisor: Dr. Frank Vollmer) *"Theory of plasmon enhanced whispering-gallery mode biosensing"*
Dec 2011 – Sep 2012	**KTS Research Fellow**, National Physical Laboratory, UK (Host: Prof. Richard Leach) *"Characterisation and calibration of 3D optical tomographic systems for surface metrology"*
Nov 2010 – Nov 2011	**Research Associate**, Photonics, Imperial College London, UK (Supervisor: Prof. Peter Török) *"SUper-Resolution Photonics for Advanced Storage Systems (SURPASS)"*
Jan 2010 – Oct 2010	**EPSRC Research Fellow**, Photonics, Imperial College London, UK (Supervisor: Prof. Peter Török) *"Single molecule studies via polarisation microscopy"*
Oct 2006 – Jan 2010	**PhD Physics**, Imperial College London, UK (Supervisor: Prof. Peter Török) *"Informational limits in optical polarimetry and vectorial imaging"*

Education

2002 – 2006	**MPhys Physics, Trinity College, University of Oxford, UK** 1st class Major options – *"Lasers and Quantum Information Processing"* and *"Condensed Matter Physics"* Research project – *"Analogue simulation of non-linear systems"* (Supervisor: Dr. Guy Peskett)
– 2002	**A-Level, Rainham Mark Grammar School, Kent, UK** - 5 at A including Mathematics, Further Mathematics and Physics

Awards and honours

2016 – 2021	**Royal Society University Research Fellowship** – The Royal Society, UK
2013 – 2015	**Humboldt Research Fellowship** – Alexander von Humboldt Foundation, Germany
2011 – 2016	**Visiting scholar** – Imperial College London, UK
2011	**Excellence in Teaching Award** – Faculty of Natural Sciences, Imperial College London, UK
2010	**Visiting Lecturer** – Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan
2010	**Springer Outstanding PhD Research Prize** – Springer-Verlag
2010	**EPSRC PhD Plus Fellowship** – Engineering and Physical Sciences Research Council, UK
2010	**Young Researcher Invitation** – Lindau Nobel Laureate Meeting 2010
2007	**Springer Presentation Award**
2006 – 2010	**EPSRC DTA PhD scholarship** – Engineering and Physical Sciences Research Council, UK
2006	**Peter Fisher Prize and Finals Prize** – Oxford University, UK
2003 – 2006	**Millard Exhibition/Scholarship in Physics** – Oxford University, UK

Teaching/Supervision Experience

2013	**Research intern supervisor** (1 student) – Max Planck Institute for the Science of Light, Germany
2013	**Lecturer** - Whispering Gallery Mode Resonators - SAOT Winter Academy, Hintertux, Austria
2012	**MSc Optics project supervisor** (1 student) – Department of Physics, Imperial College London, UK
2011 – 2012	**Nuffield/UROP project supervisor** (3 students) – Department of Physics, Imperial College London, UK
2011 – 2012	**MSci/BSc project assessor** (13 students) – Department of Physics, Imperial College London, UK
2010 – 2011	**Undergraduate tutorials** – Department of Physics, Imperial College London, UK
2010	**Lecturer** – Polarisation imaging (postgraduate level), Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan
2010	**Lecturer** – Fundamentals of Matlab (postgraduate level), Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan
2009 – 2011	**ERASMUS project supervisor** (2 students) – Department of Physics, Imperial College London, UK
2008 – 2010	**Experimental demonstrator** – MSc Optics laboratory, Imperial College London, UK
2007 – 2008	**Undergraduate classwork assistant** – Department of Physics, Imperial College London, UK

Citation statistics

Total papers: 35 Total books/chapters: 2 Total citations: 596 h-index: 13 Citations/year: 66

Grants and funding obtained

2016	Royal Society Fellowship ($\sim$ £620k)	2013	Humboldt Fellowship ($\sim$ €100k)
2011	EPSRC KTS grant ($\sim$ £85k)	2008	Royal Academy of Engineering travel grant ($\sim$ £1k)
2010	EPSRC PhD Plus fellowship ($\sim$ £35k)	2008	Institute of Physics travel grant ($\sim$ £0.25k)
2009	Imperial Trust grant ($\sim$ £0.5k)	2008	Valerie Myserscough grant ($\sim$ £1.2k)
2009	EU-COST grant ($\sim$ £0.5k)	2006 – 2010	EPSRC DTA PhD scholarship

Scientific collaborations

2016 – present	New York University Polytechnic School of Engineering, New York, USA
2014 – 2015	Research Center for Applied Sciences, Academia Sinica, Taipei, Taiwan
2013 – 2014	Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica (INO), Naples, Italy
2012 – 2014	Brigham and Women's Hospital, Boston, USA
2011 – present	Ben-Gurion University, Beer-Sheva, Israel
2011 – 2016	Imperial College London, London, UK
2010 – 2013	Biophotonics Institute, National Yang-Ming University, Taipei, Taiwan
2009 – 2012	Carl Zeiss AG, Jena, Germany
2009 – 2012	CEA-LETI, Grenoble, France
2008 – 2012	Eindhoven University of Technology, Eindhoven, Netherlands
2006 – 2008	Canadian National Research Center (NRC-CNRC), Ottawa, Canada

Administrative and refereeing work

2011 – present	**Proposal reviewer** - Romanian National Council for Scientific Research
2011	**Proposal reviewer** - Georgian Shota Rustaveli National Science Foundation
2007 – present	**Scientific reviewer** – Nature Publishing (NNT, NP, NC, SR), American Physical Society (PRL, PRA, PRB, APL, JAP, JCP), Optical Society of America (OE, OL, JOSAA, JOSAB, AO), IOP Publishing (NJP, MST, Metrol.), American Chemical Society (NL), Elsevier (OC), European Optical Society (JEOS-RP)
2007 – 2010	**Administrative assistant** – Journal of the European Optical Society
2007 – 2010	**Senior layout- and copy- editor** – Journal of the European Optical Society

Membership of learned societies

- Institute of Physics
- The Royal Society
- European Optical Society
- Alexander von Humboldt Foundation

Publications

Please refer to "Publication List" for full listing of peer-reviewed publications and conference contributions

Dr. Matthew R. Foreman : Publication List (last updated: January 1, 2017)

All publications are available from www.mrforeman.com/publications.php.

Peer-reviewed publications (italics denotes invited article)

- **M. R. Foreman**, F. Sedlmeir, H. G. L. Schwefel and G. Leuchs, "Dielectric tuning and coupling of whispering gallery modes using an anisotropic prism" J. Opt. Soc. Am. B **33**, 2177–2195 (2016).
- W. T. Chen, P. Török, **M. R. Foreman**, C. Y. Liao, W.-Y. Tsai, P. R. Wu and D. P. Tsai, "Integrated plasmonic metasurfaces for spectropolarimetry" Nanotechnology **27**, 224002 (2016).
- **M. R. Foreman** A. Favaro and A. Aiello "Optimal frames for polarization state reconstruction" Phys. Rev. Lett. **115**, 263901 (2015). Featured as cover article for Phys. Rev. Lett.
- E. Kim, **M. R. Foreman**, M. D. Baaske and F. Vollmer "Thermal characterisation of (bio)polymers with a temperature-stabilized whispering gallery mode microsensor" Appl. Phys. Lett. **106**, 161101 (2015).
- **M. R. Foreman** and F. Vollmer "Tracking anomalous diffusion kinetics in polymer microspheres" Phys. Rev. Lett. **114**, 118001 (2015). Featured as "Editor's Suggestion" in Phys. Rev. Lett.
- ***M. R. Foreman**, J. D. Swaim and F. Vollmer "Whispering gallery mode sensors" Adv. Opt. Photon. **7**, 168–240 (2015).*
- M. D. Baaske, **M. R. Foreman** and F. Vollmer "Single molecule nucleic acid interactions monitored on a label-free microcavity biosensor platform" Nat. Nanotech. **9**, 933–939 (2014).
- Y. Sonnefraud, H. G. Sinclair, Y. Sivan, **M. R. Foreman**, C. W. Dunsby, M. A. A. Neil, P. M. French and S. A. Maier "Experimental proof of concept of nanoparticle assisted STED" Nano. Lett. **14**, 4449–4453 (2014).
- ***M. R. Foreman**, S. Avino, R. Zullo, H.-P. Loock, F. Vollmer and G. Gagliardi "Enhanced nanoparticle detection with liquid droplet resonators" Eur. Phys. J. Spec. Top. **223**, 1971–1988 (2014).*
- C. Macías-Romero, **M. R. Foreman**, P. R. T. Munro and P. Török "Confocal polarization imaging in high numerical aperture space" Opt. Lett. **39**, 2322–2325 (2014). Featured in V. J. Biomed. Opt.
- *N. Mazumder, C.-W. Hu, J. Qiu, **M. R. Foreman**, C. Macías-Romero, P. Török, and F.-J. Kao "Revealing molecular structure and orientation with Stokes vector resolved second harmonic generation microscopy" Methods **66**, 237–245 (2014).*
- **M. R. Foreman**, W.-L. Jin and F. Vollmer "Optimizing detection limits in whispering gallery mode biosensing" Opt. Express **22**, 5491–5511 (2014). Featured in V. J. Biomed. Opt.
- G. Antonacci, **M. R. Foreman**, C. Paterson and P. Török "Spectral broadening in Brillioun imaging" Appl. Phys. Lett. **103** 221105 (2013).
- **M. R. Foreman** and F. Vollmer "Level repulsion in hybrid photonic-plasmonic microresonators for enhanced biodetection" Phys. Rev. A **88**, 023831 (2013).
- **M. R. Foreman** and F. Vollmer "Theory of resonance shifts of whispering gallery modes by arbitrary plasmonic nanoparticles" New J. Phys.**15**, 083006 (2013). Featured as a "Highlight of 2013" by New J. Phys.
- **M. R. Foreman**, C. L. Giusca, P. Török and R. K. Leach "Phase-retrieved pupil function and coherent transfer function in confocal microscopy" J. Microsc. **251**, 99–107 (2013).
- **M. R. Foreman**, C. L. Giusca, J. M. Coupland, P. Török and R. Leach, "Determination of the transfer function for optical surface topography measuring instruments - a review" Meas. Sci. Technol. **24**, 052001 (2013).
- N. Mazumder, J. Qiu, **M. R. Foreman**, C. Macías-Romero, P. Török, and F.-J. Kao, "Stokes vector based polarization resolved second harmonic microscopy of starch granules" Biomed. Opt. Express **4**, 538–547 (2013).
- **M. R. Foreman**, Y. Sivan, S. A. Maier and P. Török "Independence of plasmonic near-field enhancements to illumination beam profile " Phys. Rev. B **86**, 155441 (2012).
- N. Mazumder, J. Qiu, **M. R. Foreman**, C. Macías-Romero, C. Hu, H. Tsai, P. Török, and F. Kao, "Polarization-resolved second harmonic generation microscopy with a four-channel Stokes-polarimeter" Opt. Express **20**, 14090–14099 (2012).
- C. Macías-Romero, **M. R. Foreman** and P. Török, "Spatial and temporal variations in vector fields" Opt. Express **19**, 25077–25083 (2011).
- **M. R. Foreman** and P. Török, "Fundamental limits in single molecule orientation measurements" New J. Phys. **13**, 093013 (2011). Image featured in New J. Phys promotional material.
- **M. R. Foreman** and P. Török, "Spin-orbit coupling and conservation of angular momentum flux in non-paraxial imaging of forbidden radiation" New J. Phys. **13**, 063041 (2011).

Peer-reviewed publications ctd.

- C. Macías-Romero, R. Lim, **M. R. Foreman** and P. Török, "Synthesis of partially spatially coherent beams" Opt. Lett. **36** 1638–1640 (2011).
- ***M. R. Foreman*** *and P. Török, "Computational methods in vectorial imaging" J. Mod. Opt.* **58** *339–364 (2011)*
- T. Dellwig, **M. R. Foreman** and F.-J. Kao, "Coherent long-distance signal detection using stimulated emission: a feasibility study" Chinese J. Phys. **48** 873–884 (2010).
- **M. R. Foreman** and P. Török, "Information and resolution in electromagnetic optical systems" Phys. Rev. A **82** 043835 (2010). Image featured in Phys. Rev. A Kaleidoscope.
- **M. R. Foreman** and P. Török, "Focusing of inhomogeneous partially coherent, partially polarised electromagnetic fields" J. Opt. Soc. Am. A **26** 2470-2479 (2009).
- **M. R. Foreman**, C. Macías-Romero, and P. Török, "*A priori* information and optimisation in polarimetry" Opt. Express **16** 15212-15227 (2008).
- **M. R. Foreman**, C. Macías-Romero, and P. Török, "Determination of the three dimensional orientation of single molecules" Opt. Lett. **33** 1020–1022 (2008). Featured in V. J. Biomed. Opt.
- **M. R. Foreman**, S. S. Sherif, P. R. T. Munro, and P. Török, "Inversion of the Debye-Wolf diffraction integral using an eigenfunction representation of the electric fields in the focal region" Opt. Express **16** 4901-4917 (2008). Featured in V. J. Biomed. Opt.
- S. S. Sherif, **M. R. Foreman**, and P. Török "Eigenfunction expansion of the electric fields in the focal region of a high numerical aperture focusing system" Opt. Express **16** 3397–3407 (2008). Featured in V. J. Biomed. Opt.
- **M. R. Foreman**, S. S. Sherif, and P. Török, "Photon statistics in single molecule orientational imaging" Opt. Express **15** 13597-13606 (2007). Featured in V. J. Biomed. Opt.

Submitted and non peer-reviewed publications

- **M. R. Foreman**, "Single-particle spectroscopy: Whispers of absorption" Nat. Photon. **10**, 755–757 (2016).
- **M. R. Foreman**, D. Keng, E. Treasurer, J. Lopez and S. Arnold, "Whispering gallery mode single nano-particle detection and sizing: the validity of the dipole approximation" arXiV: 1611.09550 (2016).
- F. Sedlmeir, **M. R. Foreman**, U. Vogl, R. Zeltner, G. Schunk, D. V. Strekalov, C. Marquardt, G. Leuchs and H. G. L. Schwefel "Polarization-selective out-coupling of whispering gallery modes" arXiV: 1608.07660 (2016).

Books and book chapters

- S. Arnold, D. Keng, E. Treasurer and **M. R. Foreman**, *How latitude location on a micro-world enables real-time nanoparticle sizing*, in "Nano-Optics: Principles Enabling Basic Research and Applications", B. Di Bartolo, J. Collins, and L. Silvestri, eds., NATO Science for Peace and Security Series B: Physics and Biophysics (Springer Netherlands, 2017).
- **M. R. Foreman**, "Informational limits in optical polarimetry and vectorial imaging" Springer Theses Series (Springer, 2012)

Selected conference/colloquia presentations (italics denotes invited contribution)

- Y. Sivan, **M. R. Foreman**, N. T. Urban and S. W. Hell "STED nanoscopy assisted by small metal nanoparticles new advances" Nanometa 2017, Tirol, Austria, Jan 2017.
- **M. R. Foreman**, A. Favaro and A. Aiello "Multipoles, spherical t-designs and polarization state reconstruction" Particle, Condensed Matter and Quantum Physics: Links Via Maxwells Equations Topical Meeting, Chicheley Hall, UK, Nov 2015.
- **M. R. Foreman**, A. Favaro and A. Aiello "Optimal Frames for Polarisation State Reconstruction" 600. WE Heraeus Workshop, Bad Honnef, Germany, Oct 2015.
- **M. R. Foreman** and F. Vollmer "Nanoparticle based plasmonic enhancement of high Q optical microresonators" IPC 14, San Diego, USA, Oct 2014.
- **M. R. Foreman**, M. D. Baaske and F. Vollmer "Single molecule detection with a high Q plasmonic-photonic biosensor" Photon 14, London, UK, Sep 2014.
- **M. R. Foreman**, A. Webster, J. Huang and F. Vollmer "Single particle sensing with conically scattered surface plasmons" Photon 14, London, UK, Sep 2014.
- *M. D. Baaske,* ***M. R. Foreman*** *and F. Vollmer, "Single molecule detection with high Q plasmonic photonic biosensors" ICTON 2014, Graz, Austria, Jul 2014.*
- **M. R. Foreman**, W.-L. Jin and F. Vollmer, "Optimizing detection limits in whispering gallery mode biosensing" 560. WE Heraeus Workshop, Bad Honnef, Germany, Apr 2014.

Selected conference/colloquia presentations ctd.

- G. Antonacci, **M. R. Foreman**, C. Paterson and P. Török, "Scanning confocal Brillouin microscopy" Focus on Microscopy 2014, Sydney, Australia, Apr 2014.
- *F. Vollmer,* ***M. R. Foreman****, M. Baaske "Level-repulsion in hybrid photonic plasmonic resonators: enhancing WGM biosensing," SPIE Photonics West, San Francisco, USA, Feb 2014.*
- G. Antonacci, **M. R. Foreman**, C. Paterson and P. Török, "Dark field Brillouin microscopy for biomedical imaging " ECBO 2013, Munich, Germany, May 2014.
- G. Antonacci, **M. R. Foreman**, C. Paterson and P. Török, "Dark-field brillouin microscopy for elasticity imaging" Focus on Microscopy 2013, Maastricht, Netherlands, Apr 2013.
- Y. Sivan, **M. R. Foreman**, S. Maier and P. Török "Independence of plasmonic near-field enhancements to the illumination beam profile" The International Conference on Surface Plasmon Photonics SPP6, Ottawa, Canada May 2013.
- R. K. Leach, J. Coupland, R. Mandal, C. Giusca, **M. R. Foreman** "Calibration of areal surface topography measuring instruments: are we there yet?" 27th Annual Meeting of the American Society for Precision Engineering, San Diego, USA October 2012.
- **M. R. Foreman**, Y. Sivan, and P. Török, "Illumination matching in plasmonic fluorescence imaging" Focus on Microscopy 2012, Singapore, Apr 2012.
- ***M. R. Foreman****, and P. Török, "Fundamental limits in determining the orientation of single molecules" IEEE International Symposium on Biomedical Imaging, Barcelona, Spain May 2012.*
- ***M. R. Foreman****, and P. Török, "Analysis of resolution in data storage and beyond" IQEC/CLEO Pacific Rim, Sydney, Australia Aug 2011.*
- **M. R. Foreman**, and P. Török, "Rigorous electromagnetic imaging of spheres on dielectric surfaces" Focus on Microscopy 2011, Konstanz, Germany Apr 2011.
- **M. R. Foreman**, and P. Török, "Focusing of inhomogeneous partially coherent, partially polarised electromagnetic fields" EOS Advanced Imaging Topical Meeting, Engelberg, Switzerland June 2010.
- ***M. R. Foreman****, and P. Török, "Singular system analysis in electromagnetic focusing problems" TaCoNa Photonics 2009, Bad Honnef, Germany Oct 2009.*
- *C. Macías-Romero, A. S. Van de Nes,* ***M. R. Foreman****, P. R. T. Munro and P. Török, "Multiplexed optical data storage" nanoCharm Advanced Polarimetric Imaging Techniques Meeting, Paris, France November 2009.*
- **M. R. Foreman**, C. Macías-Romero, and P. Török, "Information theoretic analysis of polarisation microscopy," EOS Advanced Imaging Topical Meeting, Jena, Germany June 2009.
- **M. R. Foreman**, C. Macías-Romero, and P. Török, "Determination of the three dimensional orientation of single molecules," Focus on Microscopy 2009, Krakow, Poland Apr 2009.
- **M. R. Foreman**, S. S. Sherif, P.R.T. Munro, and P. Török, "Inverse problems in high numerical aperture focusing systems," Focus on Microscopy 2008, Osaka, Japan Apr 2008.
- **M. R. Foreman**, S. S. Sherif, and P. Török, "Polarisation structured illumination," EOS Advanced Imaging Topical Meeting, Lille, France Sept 2007.
- **M. R. Foreman**, S. S. Sherif, and P. Török, "Determination of the orientation of a dipole subject to random orientational motion," Focus on Microscopy 2007, Valencia, Spain Apr 2007.