

## CURRICULUM VITAE: MILES PADGETT FRSE

SCHOOL OF PHYSICS AND ASTRONOMY, UNIVERSITY OF GLASGOW. G12 8QQ

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AUGUST 2010

### PERSONAL DETAILS:

Name: Miles John Padgett  
Date of Birth: 1st June 1963  
Age: 47



### EDUCATION:

1981 - 1982 University of Manchester  
1982 - 1984 University of York  
1984 - 1985 University of St Andrews  
1985 - 1988 Trinity College, Cambridge University

### QUALIFICATIONS:

BSc (1984): First Class Honours, Experimental Physics (York)  
MSc (1985): Distinction, Optoelectronic and Laser Devices (St. Andrews)  
PhD (1989): Laser Physics (Cambridge University)

### AWARDS AND FELLOWSHIPS:

1988 Trinity College, External Studentship/Senior Rouse Ball Studentship  
1993 Royal Society of Edinburgh/BP Research Fellowship  
1994 National Physical Laboratory, Metrology Award  
1995 Royal Society Research Fellowship  
1998 Metrology Prize for World Class Manufacturing  
2001 Elected to Fellowship of the Royal Society of Edinburgh  
2002 Awarded Fellowship of the Institute of Physics  
2002 Royal Society of Edinburgh, Inspiration Award  
2007 Royal Society, Leverhulme Trust Senior Research Fellowship  
2008 Optics and Photonics Division Prize, Institute of Physics  
2009 Young Medal and Prize, Institute of Physics  
2009 Royal Society-Wolfson Research Merit Award

### EMPLOYMENT HISTORY:

1989 - 1992 Consultant/Senior Consultant, PA Technology  
1992 - 1993 Teaching and Research Fellowship, St Andrews University  
1993 - 1995 Royal Society of Edinburgh/BP Research Fellow, St Andrews  
1995 - 1999 Royal Society University Research Fellow, St Andrews University  
1999 - 2003 Royal Society University Research Fellow, Glasgow University  
1999 - Professor of Physics, Glasgow University

### CURRENT RESEARCH INTERESTS:

Miles Padgett is Professor of Optics in the Department of Physics and Astronomy at the University of Glasgow. He heads a 15-person team covering a wide spectrum from blue-sky research to applied commercial development, funded by a combination of government charity and industry. In 2001 he was elected to Fellowship of the Royal Society of Edinburgh. In 2007/8 he was a Leverhulme Trust Royal Society Senior Research Fellow.

In 2008 Padgett was awarded the Institute of Physics Optics and Photonics Division Prize and in 2009 the Young Medal and Prize for "pioneering work on optical angular momentum. In 2009 he received a Royal Society-Wolfson Merit Award.

Padgett has international reputation for his contribution to the fundamental understanding of light's momentum, including conversion of optical tweezers to optical spanners, observation of a rotational form of the Doppler shift and an angular form of Heisenberg's uncertainty principle. Padgett has published over 200 papers that have amassed  $\approx 5000$  citations in the world's leading scientific journals. He has made a number of TV and radio appearances and numerous public lectures -- promoting science and technology to the widest possible audience.

**RESEARCH EXAMPLES/HIGHLIGHTS:**

|      |                                                                  |
|------|------------------------------------------------------------------|
| 2010 | Isolated optical knots                                           |
| 2009 | Holographic Ghost Imaging                                        |
| 2008 | Fractality and Topology of light's darkness                      |
| 2006 | Optically controlled nanohand                                    |
| 2004 | Dark knots and links in light                                    |
| 2003 | Colours of darkness                                              |
| 2002 | Distinguishing between light's spin and orbital angular momentum |
| 1998 | Rotational Doppler shift                                         |
| 1997 | Optical spanner                                                  |

**CURRENT MANAGEMENT ROLES WITHIN THE UNIVERSITY OF GLASGOW:**

|             |                                                             |
|-------------|-------------------------------------------------------------|
| 2008 -      | Member of University Research Policy and Strategy Committee |
| 2008 - 2010 | Associate Dean for Research (Physical Sciences)             |
| 2004 - 2009 | Member of 3-man Departmental management team                |
| 1999 -      | Head of Optics Group, Department of Physics and Astronomy   |
| 1999 -      | Member of Departmental Research Strategy Committee          |

**CURRENT RESEARCH GROUP AT GLASGOW UNIVERSITY:**

4 Research Assistants, 7 Research Students

**PERSONNEL OUTPUT FROM RESEARCH GROUP:**

15 Doctorates (all within 4 years), 1 Masters by research

**MEMBERSHIP OF EXTERNAL COMMITTEES (2001-):**

|             |                                                                          |
|-------------|--------------------------------------------------------------------------|
| 2010        | Member of EPSRC Physics Grand Challenges Advisory Group                  |
| 2009 -      | Member of advisory committee to Exeter University – functional materials |
| 2009        | Chairman of EPSRC Physics prioritisation panel (Oct)                     |
| 2009        | Chair of Institute of Physics Conference Strategy working party          |
| 2009        | Invited participant of EPSRC ThinkFree Workshop                          |
| 2009        | Chairman of EPSRC Physics prioritisation panel (Jan)                     |
| 2008 - 2009 | Member of Photonics Knowledge Transfer Network Steering Group            |
| 2008 --     | Member of EPSRC Cross Disciplinary Interfaces Strategic Advisory Team    |
| 2007        | Member of EPSRC Collaborating for success through people panel           |
| 2006        | Member of EPSRC Life Sciences prioritisation panel                       |
| 2006 - 2008 | Member of EPSRC Physics Strategic Advisory Team                          |
| 2006 --     | Photonics Theme Leader, SUPA                                             |
| 2005        | Member of EPSRC Instrumentation prioritisation panel                     |
| 2005 --     | Member of Institute of Physics Science Board                             |
| 2005 - 2008 | Convener of Royal Society of Edinburgh's Young Persons Committee         |
| 2005        | Chairman of EPSRC Physics prioritisation panel                           |
| 2005 - 2008 | Member of Royal Society of Edinburgh Executive Board                     |
| 2004 - 2005 | Member of Royal Society of Edinburgh's Young Persons Committee           |
| 2004        | Member of Royal Society of Edinburgh's delegation to China               |
| 2004        | Member of EPSRC Physics into Healthcare prioritisation panel             |
| 2004 - 2009 | Chairman of the Institute of Physics Conferences Committee               |
| 2003        | Chairman of EPSRC Physics prioritisation panel                           |
| 2003        | Organiser for Rank Prize Symposium                                       |
| 2003        | Member of EPSRC Adventure prioritisation panel                           |
| 2003 - 2005 | Member of High Technology Talent Strategy Board for Scotland             |
| 2003        | Member of organizing committee for IoP's 100 years after Einstein        |
| 2002 -      | Editorial board of Journal of Modern Optics                              |
| 2002        | Chairman of the EPSRC Physics into Healthcare prioritisation panel       |
| 2002 - 2006 | Member of Scottish Physics Teachers Summer School Committee              |
| 2001        | Member of organizing committee for QE-15                                 |
| 2001        | Chairman of EPSRC Light and Matter focus group                           |
| 2001        | Chairman of EPSRC Physics prioritisation panel                           |
| 2001 - 2004 | Organiser of Royal Society of Edinburgh's Masterclasses (Glasgow)        |
| 2001 - 2004 | Member of Royal Society of Edinburgh's Physics sectional committee       |

## INVITED PRESENTATIONS (2001-)

- 2010  
Quantum Comm., Meas. and Comput. Conf., Brisbane, Australia  
Microscience 2010, London, UK  
Summer School of Opto-Informatics, Maynooth, Ireland  
50th Anniversary of Lasers at Imperial College, UK  
Trends in Optical Micromanipulation II, Obergurgl, Austria  
International Conference on Orbital Angular Momentum, York, UK  
IONs 7, OSA Student Chapter – Galway, Ireland
- 2009  
Conference on Laser Ablation (COLA), Singapore  
Annual meeting of the Danish Optical Society, Sønderborg, Denmark  
Correlation Optics, Chernivtsi, Ukraine  
Computational Optical Sensing and Imaging, San Jose, USA  
Advanced Laboratory Physics Association, Michigan USA  
Opening ceremony of the Max Planck Institute for the Science of Light, Erlangen, Germany  
Summer School 'Introduction to Optofluidics', Trieste, Italy  
50 years of Semiconductor and Optics Research in the UK
- 2008  
Frontiers in Optics, OSA, Rochester, USA  
Annual Meeting European Optical Society, Paris, France  
Photon 08, Edinburgh.  
Singular Optics, Alushta, Ukraine,  
Optical Microscopy in Good Shape, Paris, France  
Rank Prize Symposium, Ambleside, UK
- 2007  
Optics and Photonics, SPIE, San Diego, USA  
IEEE/LEOS Optical MEMS and Nanophotonics, Hualien, Taiwan  
OSA, Rochester Coherence Conference, USA  
Trends in Optical Micromanipulation, Obergurgl, Austria
- 2006  
SPIE Photonics West, Nanomanipulation, San Jose, USA  
Winter School, Quantum Optics, Trieste, Italy  
Bio-Dielectrics, IoP, Leicester, UK
- 2005  
Institute of Physics (Ireland) Invited lecture tour  
Topology in Ordered Phases, Sapporo, Japan  
New Detection Techniques, Shell, Rijswijk, Holland  
European Optical Society, Imperial College, London, UK
- 2004  
Sino-Scottish Science, Sharing Ideas, Beijing, China  
SPIE Optical Science and Technology, Complex mediums, Denver, USA  
SPIE Optical Science and Technology, Optical trapping, Denver, USA  
OSA, Laser Science, Rochester, USA
- 2003  
Royal Society's Summer Science Exhibition  
Rank Prize Symposium, Grasmere, UK  
Singular Optics, Kiev, Ukraine  
Biomedical Optics, Silsoe, UK  
QuAMP, Milton Keynes, UK  
Frontiers in Optics, OSA, Arizona, USA
- 2002  
Quantum, Briançon, France  
BA festival of Science, Glasgow UK
- 2001  
Rank Prize Symposium, Grasmere, UK  
National Quantum Electronics Conf. QE-15, Glasgow, UK

**GRANTS AND CONTRACTS (OBTAINED WHILE AT GLASGOW 1999-):**

|                                                                                                                                                                     |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Consultancy for modeling of inverse problems<br>M J Padgett, Shell Global Solution, 2009                                                                            | £2,000     |
| Multi-object, high-throughput, spectro-microscopy<br>MJ Padgett EPSRC (Glasgow Share), 2009-13                                                                      | £327,523   |
| MJ Padgett, Royal Society, Wolfson Merit Award, 2009-14                                                                                                             | £100,000   |
| Translating the Dynamic Holographic Assembler<br>MJ Padgett EPSRC (Glasgow Share), 2009-12                                                                          | £208,622   |
| Full field quantum imaging<br>M Padgett, D Ireland, S Franke-Arnold, S Barnett R Hadfield and G Buller, EPSRC, 2009-12                                              | £1,478,695 |
| HIDEAS (High dimensional entanglement of quantum systems)<br>EU consortium inc. M J Padgett, EU Framework 7 (FET) (Glasgow Share) 2008-11                           | £100,301   |
| Consultancy for modeling of inverse problems<br>M J Padgett, Shell Global Solution, 2008                                                                            | £2,000     |
| Listening to the Micro-world<br>J M Cooper, M J Padgett, J Molloy and R Berry, EPSRC, 2008-10                                                                       | £1,450,598 |
| Science in the 21 <sup>st</sup> Century<br>R Crawford and M J Padgett, ERSRC, 2008                                                                                  | £24,971    |
| Consultancy for modeling of inverse problems<br>M J Padgett, Shell Global Solution, 2008                                                                            | £2,000     |
| Momentum of light in glass: how much punch does light really pack?<br>M J Padgett, Leverhulme Trust, 2007-2008                                                      | £44,107    |
| Holographic Micro Flow Meter for Biological Sensing<br>J Cooper and M J Padgett, BBSRC, 2007-2010                                                                   | £783,864   |
| Extension to a non-invasive optoelectronic device for drug detection (Glasgow share)<br>M J Padgett, Scottish Enterprise, 2007-2008                                 | £50,000    |
| Novel quantum cascade lasers for ultrasensitive trace gas detection (Departmental share)<br>M J Padgett, K Skeldon, DTI/EPSC 2006-2009                              | £329,284   |
| Knots of light in nature<br>M J Padgett and Mark Dennis, Leverhulme Trust 2006-2009                                                                                 | £127,185   |
| A non-invasive optoelectronic device for drug detection (Glasgow share of PoC project)<br>M J Padgett Scottish Enterprise, 2005-2007                                | £61,000    |
| The Abraham vs. Minkowski dilemma: an experimental resolution?<br>M J Padgett, J Girkin, S Barnett, S Franke-Arnold, R Loudon, L Allen, J Jeffers, EPSRC, 2005-2008 | £173,261   |
| The Abraham vs. Minkowski dilemma: an experimental resolution?<br>J Girkin, M J Padgett, S Barnett, S Franke-Arnold, R Loudon, L Allen, J Jeffers, EPSRC, 2005-2008 | £356,266   |
| Improvements to optical gas detector for oil prospection<br>M J Padgett, Shell Global Solutions, 2005                                                               | £17,500    |
| Ethane in Breath and Monitoring of Oxidative Stress<br>M J Padgett, K Skeldon, C Longbottom, Scottish Enterprise, 2005                                              | £62,274    |
| Dynamic Holographic Assembler (Glasgow share of Basic Technology Award)<br>M J Padgett, J Courtial, RCUK, 2005-2009                                                 | £541,549   |
| Support for the Physics 2005 Conference: A Century after Einstein<br>J D C Jones, M J Padgett and M V Berry, EPSRC, 2005                                            | £15,000    |
| Consultancy for data processing<br>M J Padgett, Shell Global Solutions 2004                                                                                         | £3,600     |
| Micro-fluidic Analytical Systems Driven and Interrogated with Holographic Optics<br>M J Padgett and J Cooper, EPSRC, 2004-07                                        | £358,073   |
| Single Molecule Manipulation & Imaging using Optical Tweezers<br>M J Padgett and J Cooper, SRIF, 2004                                                               | £220,000   |
| Extension to Visualisation of Gas for the Utilities (Vogue)<br>M J Padgett (Glasgow share), EU, 2000-04                                                             | £50,000    |
| Laser Purchase<br>M J Padgett and Jon Cooper, Unilever, 2003                                                                                                        | £9,742     |
| Development of Optical Biopsy System<br>M J Padgett, Barbara Stewart Trust, 2003-04                                                                                 | £20,000    |
| Manipulation of Nanosensors within Cells<br>J M Cooper, M J Padgett and Molloy IRC (Joint Research Council), 2003-06                                                | £251,000   |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Fluorescence monitoring instrument<br>M J Padgett, Biolitec, 2003                                                                                      | £25,000  |
| Screening tool for lung cancer<br>M J Padgett, K Skeldon, and C Longbottom, Scottish Enterprise, 2003-05                                               | £198,901 |
| Disease detection by breath monitoring<br>M J Padgett, MRC, 2003-04                                                                                    | £50,000  |
| Consultancy for modeling of inverse problems<br>M J Padgett, Shell Global Solution, 2003                                                               | £3,600   |
| Donation for Research<br>M J Padgett, Shell, 2003                                                                                                      | £25,000  |
| Ultra-high data density free-space optical communication<br>M J Padgett, J Courtial, S Barnett and S Franke-Arnold, Scottish Enterprise, 2003-05       | £184,054 |
| Multi-dimensional quantum entanglement and high density information transfer<br>M J Padgett, J Courtial, S Franke-Arnold and S Barnett, EPSRC, 2003-06 | £263,002 |
| Research Support<br>M J Padgett, Royal Society, 2002                                                                                                   | £10,600  |
| Research Support<br>M J Padgett, Royal Society, 2001                                                                                                   | £10,900  |
| Quantum entanglement<br>M J Padgett and S Barnett, Leverhulme Trust, 2001-02                                                                           | £91,180  |
| Research Support<br>M J Padgett, Royal Society, 2000                                                                                                   | £3,900   |
| Visualisation of Gas for the Utilities (Vogue)<br>M J Padgett (Glasgow share), EU, 2000-04                                                             | £203,454 |
| Research Support<br>M J Padgett, Royal Society, 2000                                                                                                   | £8,900   |
| Novel spectroscopic tool for healthcare and other applications<br>M J Padgett, EPSRC (ROPA), 2000-02                                                   | £92,867  |
| An endoscopic imaging system for photodetection of cancer in the lower GI tract<br>M J Padgett, I Tait, W Sibbett and A Cuscheiri, EPSRC, 2000-02      | £38,994  |
| Optical Bottle Beams<br>M J Padgett, EPSRC, 2000-02                                                                                                    | £47,899  |
| Self-referencing gas sensor<br>M J Padgett and W Sibbett, Royal Society, 2000                                                                          | £20,850  |
| Research Support<br>M J Padgett, Royal Society, 1999                                                                                                   | £8,900   |

**GRANTS AND CONTRACTS (OBTAINED WHILE AT ST ANDREWS 1992-99):**

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|---------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Light sources and imaging systems for cancer detection and treatment<br>W Sibbett, M Padgett, J Allen, A Cuscheiri and J Ferguson, EPSRC, 1999-01 | £105,000 |
| Wollaston Prism based wavemeter<br>M J Padgett, Royal Society, 1999                                                                               | £9,700   |
| Fractal laser beams<br>M J Padgett, ROPA/EPSRC, 1998-00                                                                                           | £82,285  |
| Optical oil prospecting<br>M J Padgett, Shell Research Ltd, 1998-99                                                                               | £70,000  |
| Fluorescence imaging of skin cancers<br>M J Padgett, Royal Society, 1998                                                                          | £8,800   |
| Endoscopic imaging system for the early detection of cancer<br>W Sibbett and M J Padgett, EPSRC, 1998-99                                          | £24,407  |
| Feasibility study for the detection of Ethane at parts per trillion<br>M J Padgett and M H Dunn, Shell Research Ltd, 1998                         | £10,000  |
| Development of a non contact optical probe<br>M J Padgett, IMS Ltd, 1998                                                                          | £57,000  |
| Versatile profilometry system for surface-inspection from engineering to medicine<br>M J Padgett, A J Duncan and W Sibbett, EPSRC, 1998-99        | £131,550 |
| Research Support<br>M J Padgett, Royal Society, 1997                                                                                              | £8,900   |
| Consultancy contract for optical design of laser distance sensor<br>M J Padgett, IMS, 1997                                                        | £1,200   |

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|-------------------------------------------------------------------------------------------------|----------|
| Propagation of non zero order modes in nonlinear media and the role of orbital angular momentum |          |
| M J Padgett, L Allen and K Dholakia, EPSRC, 1997-99                                             | £49,573  |
| A spectrometer for laboratory instrumentation                                                   |          |
| M J Padgett and W Sibbett, Siemens UK/Oriel Instruments, 1996                                   | £8,000   |
| Research Support                                                                                |          |
| M J Padgett, Royal Society, 1996                                                                | £8,800   |
| An optical system for the early detection of cancer of the oesophagus                           |          |
| M J Padgett and W Sibbett, Tenovus, 1996                                                        | £5,000   |
| Consultancy contract for computer modeling of optical inspection instrument                     |          |
| M J Padgett, IBM, 1996                                                                          | £3,200   |
| Research Support                                                                                |          |
| M J Padgett, Royal Society, 1995                                                                | £10,500  |
| Consultancy contract for optical design of a grating based spectrometer                         |          |
| M J Padgett and W Sibbett, Siemens UK, 1995                                                     | £2,500   |
| The use of novel designs of spectrometer for pollution monitoring                               |          |
| M J Padgett and W Sibbett LINK/EPSRC, 1995-1997                                                 | £116,000 |
| Optical Spanners                                                                                |          |
| M J Padgett and L Allen, ROPA/EPSRC, 1995-97                                                    | £85,000  |
| Optical realisation of the Aharonov-Bohm Effect                                                 |          |
| M J Padgett, W Sibbett and L Allen, DRA, 1995                                                   | £5,024   |
| Consultancy contract for computer modeling of an optical particle monitoring system             |          |
| M J Padgett, Siemens, 1994                                                                      | £1,200   |
| The optical detection of Hydrogen Sulphide                                                      |          |
| M J Padgett, A R Harvey and W Sibbett, Siemens, 1994-95                                         | £46,200  |
| Development of optical tweezers using diode lasers                                              |          |
| M J Padgett, Royal Society of Edinburgh, 1994                                                   | £2,500   |
| The transfer of orbital angular momentum to particles held by optical tweezers                  |          |
| M J Padgett and L Allen, SERC, 1994-96                                                          | £30,064  |
| A novel design of Fourier-transform spectrometer                                                |          |
| M J Padgett, A R Harvey, A Duncan and W Sibbett, Paul Instrument Fund, 1994-95                  | £35,000  |
| Optical techniques for surface inspection                                                       |          |
| M J Padgett and W Sibbett, Photonex Ltd, 1994                                                   | £22,000  |
| Experiments to illustrate the orbital angular momentum of light                                 |          |
| M J Padgett, Royal Society of Edinburgh, 1993                                                   | £2,500   |
| LCD surface inspection                                                                          |          |
| M J Padgett and W Sibbett, Photonex Ltd, 1993                                                   | £12,500  |
| Tunable Continuous-Wave, Optical Parametric Oscillators                                         |          |
| M H Dunn, B D Sinclair and M J Padgett, SERC, 1993-96                                           | £212,200 |
| Consultancy contract for optical system design                                                  |          |
| M J Padgett, PA Consulting Group, 1993                                                          | £2,670   |
| Consultancy contract for laser based surface inspection techniques                              |          |
| M J Padgett, IBM, 1992-93                                                                       | £7,250   |

## JOURNAL PUBLICATIONS (TOTAL WOS CITATIONS >5000, H-INDEX 40)

- 219) Quantum Correlations in Optical Angle-Orbital Angular Momentum Variables, J Leach, B Jack, J Romero, A K Jha, A M Yao, S Franke-Arnold, D Ireland, R W Boyd, S M Barnett, M J Padgett *Science* 329, 662-665 (2010)
- 218) Particle tracking stereomicroscopy in optical tweezers: Control of trap shape, R Bowman, G Gibson and M Padgett *Opt. Express* 18, 11785-11790 (2010)
- 217) Entanglement of arbitrary superpositions of modes within two-dimensional orbital angular momentum state spaces, B Jack, A M Yao, J Leach, J Romero, S Franke-Arnold, D G Ireland, S M Barnett, and M. J. Padgett *Phys. Rev. A* 81, 043844 (2010)
- 216) Calibration of optically trapped nanotools, D M Carberry, S H Simpson, J A Grieve, Y Wang, H Schäfer, M Steinhart, R Bowman, G M Gibson, M J Padgett, S Hanna and M J Miles *Nanotechnology* 21, 175501 (2010)
- 215) Real time characterization of hydrodynamics in optically trapped networks of micro-particles, A Curran, A M Yao, G M Gibson, R Bowman, J M Cooper and M J. Padgett *J. Biophoton.* 3, 244–251 (2010)
- 214) Measuring storage and loss moduli using optical tweezers: Broadband microrheology, M Tassieri, G M Gibson, R M L Evans, A M Yao, R Warren, M J Padgett, and J M Cooper *Phys. Rev. E* 81, 026308 (2010)
- 213) A polyphonic acoustic vortex and its complementary chords, C Wilson and M J Padgett *New J. Phys.* 12, 023018 (2010)
- 212) Isolated optical vortex knots, M R Dennis, R P King, B Jack, K O'Holleran and M J Padgett *Nature Physics* 6, 118-121 (2010)
- 211) Angular two-photon interference and angular two-qubit states, A K Jha, J Leach, B Jack, S Franke- Arnold, S M Barnett, R W Boyd and M J Padgett *Phys. Rev. Lett.* 104, 010501 (2010)
- 210) Increasing trap stiffness with position clamping in holographic optical tweezers, D Preece, R Bowman, A Linnenberger, G Gibson, S Serati and M Padgett *Opt. Express* 17, 22718-22725 (2009)
- 209) Precise quantum tomography of photon pairs with entangled orbital angular momentum, B Jack, J Leach, H Ritsch, S M Barnett, M J Padgett and S Franke-Arnold *New J. Phys.* 11, 10302 (2009)
- 208) Droplets set light in a spin, M Padgett *Nature*, 461, 600-601 (2009)
- 207) Microrheology with optical tweezers, A. Yao, M. Tassieri, M. Padgett and J. Cooper *Lab Chip* 9, 2568-2575 (2009)
- 206) Holographic Ghost Imaging and the Violation of a Bell Inequality, B Jack, J Leach, J Romero, S Franke-Arnold, M Ritsch-Marte, S M Barnett, and M J Padgett *Phys. Rev. Lett.* 103, 083602 (2009)
- 205) Exhaled ethane concentration in patients with cancer of the upper gastrointestinal tract - a proof of concept study, J E Abela, K D Skeldon, M J Padgett and R C Stuart *BioScience Trends.* 3, 110-114 (2009)
- 204) Methodology for imaging the 3D structure of singularities in scalar and vector optical fields, K O'Holleran, F Flossmann, M R Dennis and M J Padgett *J. Opt. A: Pure Appl. Opt.* 11, 0094020 (2009)
- 203) Optical trapping studies of colloidal interactions in liquid films, R Di Leonardo F Ianni F Saglimbeni, G Ruocco, S Keen, J Leach and M Padgett *Colloid Surface A*, 343, 133-136 (2009)
- 202) Multipoint viscosity measurements in microfluidic channels using optical tweezers, S Keen, A Yao, J Leach, R Di Leonardo, C Saunter, G Love, J Cooper and M Padgett *Lab Chip* 9, 2059-2062 (2009)
- 201) Singular Optics: Optical Vortices and Polarization Singularities, M R Dennis, K O'Holleran and M J Padgett *Progress in Optics* 53, 293-364 (2009)
- 200) Touching the microworld with force-feedback optical tweezers, C Pacoret, R Bowman, G Gibson, S Haliyo, D Carberry, A Bergander, S Régnier, and M Padgett *Opt. Express* 17, 10259-10264 (2009)
- 199) Underdamped modes in a hydrodynamically coupled microparticle system, A M Yao, S A J Keen, D R Burnham, J Leach, R Di Leonardo, D McGloin, and M J Padgett, *New J. Phys.* 11, 053007 (2009)
- 198) Violation of a Bell inequality in two-dimensional orbital angular momentum state-spaces J Leach, B Jack, J Romero, M Ritsch-Marte, R W Boyd, A K Jha, S M Barnett, S Franke-Arnold and M J Padgett *Opt. Express* 17, 8287-8293 (2009)

- 197) Manipulation of live mouse embryonic stem cells using holographic optical tweezers, J Leach, D Howard, S Roberts, G Gibson, D Gothard, J Cooper, K Shakesheff, M Padgett, L Buttery  
J. Mod. Opt. 56, 448-452 (2009)
- 196) Topology of Light's Darkness, K O'Holleran, M R Dennis and M J Padgett  
Phys. Rev. Lett. 102, 143902 (2009)
- 195) Hands-on with optical tweezers: a multitouch interface for holographic optical trapping J A Grieve, A Ulcinas, S Subramanian, G M Gibson, M J Padgett, D M Carberry, and M J Miles  
Opt. Express 17, 3595-3602 (2009)
- 194) Assembly and force measurement with SPM-like probes in holographic optical tweezers, L Ikin, D M Carberry, G M Gibson, M J Padgett and M J Miles  
New J. Phys. 11, 023012 (2009)
- 193) Comparison of Faxén's correction for a microsphere translating or rotating near a surface, J Leach, H Mushfique, S Keen, R Di Leonardo, G Ruocco, J M Cooper and M J Padgett  
Phys Rev. E 79, 026301 (2009)
- 192) On the focussing of light, as limited by the uncertainty principle, M Padgett  
J. Mod. Opt. 55, 3083-3089 (2008)
- 191) A spatial light phase modulator with an effective resolution of 4 mega-pixels, D Preece, E Yao, G Gibson, R Bowman, J Leach and M Padgett  
J. Mod. Opt. 55, 2945-2951 (2008)
- 190) On diffraction within a dielectric medium as an example of the Minkowski formulation of optical momentum, M J Padgett  
Opt. Express 16, 20864-20868 (2008)
- 189) High throughput diffractive multi-beam femtosecond laser processing using a spatial light modulator, Z Kuang, W Perrie, J Leach, M Sharp, S P Edwardson, M Padgett, G Dearden, K G Watkins  
Appl. Sur. Sci. 255, 2284-2289 (2008)
- 188) Hydrodynamic interactions in two dimensions, R Di Leonardo, S Keen, F Ianni, J Leach, M J Padgett and G Ruocco,  
Phys Rev. E 78, 031406 (2008)
- 187) Angular diffraction, B Jack, M J Padgett and S Franke-Arnold  
New J. Phys 10, 103013 (2008)
- 186) Fourier relationship between the angle and angular momentum of entangled photons, A K Jha, B Jack, E Yao, J Leach, R W Boyd, G S Buller, S M Barnett, S Franke-Arnold, and M J Padgett  
Phys. Rev. A 78, 043810 (2008)
- 185) Three-dimensional parallel holographic micropatterning using a spatial light modulator, N J Jenness, K D Wulff, M S Johannes, M J Padgett, D G Cole and R L Clark  
Opt. Express, 16, 15942-15948 (2008)
- 184) Independent polarisation control of multiple optical traps, D Preece, S Keen, E Botvinick, R Bowman, M Padgett and J Leach  
Opt. Express, 16, 15897-15902 (2008)
- 183) Measuring the accuracy of particle position and force in optical tweezers using high-speed video microscopy, G Gibson, J Leach, S Keen, A J Wright and M J Padgett  
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