

## ***Curriculum Vitae***

<b>Name</b>	Dr Justin Paul Phillips
<b>Address</b>	27 Sekforde Street, London, EC1R 0HH, United Kingdom
<b>Phone</b>	+44 (0)207 040 8920
<b>Mobile Phone</b>	+44 (0)7515 352629
<b>Email</b>	Justin.Phillips.1@city.ac.uk
<b>Website</b>	justinphillips.org
<b>Educational background</b>	BSc (Physics), PhD (Biomedical Engineering)
<b>Expertise</b>	Photoplethysmography (PPG), optical bio-sensors, wearable sensors, bio-signal processing, non-invasive cardiovascular monitoring, cerebral monitoring, medical device clinical trials.

## **EDUCATION**

- 1992 BSc(Hons) in Physics, University of Durham, UK.  
Subject of project thesis: High-resolution Gamma-ray Spectroscopy
- 2009 PhD Biomedical Engineering, Barts and The London School of Medicine/Dept. of Engineering, Queen Mary, University of London, UK.  
Subject of thesis: New Optical Methods for Monitoring Cerebral Oxygenation in Head Injured Patients

## **PROFESSIONAL EXPERIENCE**

### **Current posts**

- 2015-2016 RAEng/Leverhulme Trust Senior Research Fellow.
- 2011-Present Senior Lecturer (Associate Professor), Dept. of Electrical and Electronic Engineering, City University, London, UK.

### **Honorary Appointments**

- 2009-Present Honorary Research Fellow, Dept. of Anaesthesia, St. Bartholomew's Hospital, London

### **Previous posts**

- 2008-2011 Lecturer (Assistant Professor), Dept. of Electrical and Electronic Engineering, City University, London, UK.
- 1999-2008 Principal Technologist, Anaesthetic Laboratory, St. Bartholomew's Hospital, Barts and The London NHS Trust, London, UK.

- 1997-1999 Clinical Measurement Technician, Lung Function Unit, The Royal Brompton and Harefield NHS Trust, London, UK.
- 1994-1997 Research Technician, Ciba Corning Diagnostics Ltd, Sudbury, Suffolk, UK.

## GRANTS AND AWARDS

### Grants Awarded

- 2005–2007 The Heptagon Fund Research Grant  
(JP Principal Investigator)  
Title: 'Fibre Optic Sensors for Measurement of Cerebral Oxygenation'  
Value: £94,264
- 2010–2011 City University Research Competition  
(JP Principal Investigator)  
Title: 'Photoplethysmography-based Algorithms for Noninvasive Haemoglobin Measurement'  
Value: £40,000
- 2011–2012 National Institute for Academic Anaesthesia (NIAA) Research Grant  
(JP Co-Investigator)  
Title: 'Blood Flow Assessment Following Spinal Cord Root Avulsion Injury'  
Value: £44,110
- 2014–2016 Barts Charity Strategic Research Award  
(JP Principal Investigator)  
Title: 'The Sensing ET Tube: Endotracheal Patient Monitoring'  
Value: £172,246
- 2014–2017 National Institute of Healthcare Research (NIHR) i4i Product Development Award  
(JP Co-Investigator)  
Title: 'Development of a Multi-parameter Oesophageal Sensor for the Early Detection of MODS'  
Value: £720,219
- 2015–2016 Royal Academy of Engineering/Leverhulme Trust Senior Research Fellowship  
(JP Principal Investigator)  
Title: 'nICP: Noninvasive Intracranial Pressure Monitoring'  
Value: £46,655 + Travel Bursary

### Other Awards

- June 2012 Second Prize, Best Paper Presentation, IAMPOV, Yale University
- August 2013 Travel Bursary, Institute of Physics and Engineering in Medicine
- May 2014 City University Student Voice Teaching Award
- May 2015 City University Award for Innovative Teaching

## TEACHING AND ACADEMIC SUPERVISION

### Teaching

I currently teach the following courses on the Biomedical Engineering Programmes: Biomedical Optics (2<sup>nd</sup> Year BEng/MEng), Respiratory and Cardiovascular Measurement (3<sup>rd</sup> Year BEng/MEng), Biomechanics (3<sup>rd</sup> Year BEng/MEng) and Biomedical Instrumentation Labs (MSc).

In addition I supervise approximately 9 BEng/MEng/MSc projects per year in the areas of photoplethysmography, wearable sensors, bio-signal processing and cardiovascular modelling.

### PhD Supervision/Co-Supervision

#### *Current PhD projects*

- |       |  |
|-------|--|
| 2017– | Ms S Chatterjee<br>Title: 'Modelling of light tissue interactions for reflectance and wearable photoplethysmographic sensors'                      |
| 2015– | Mr R Maysam<br>Title: 'Development of a digital wearable multiwavelength photoplethysmographic system for the Investigation of muscle oxygenation' |
| 2015– | Mr S Villa<br>Title: 'Application of phononic crystals as liquid sensors'  |
| 2015– | Mr B Escobar<br>Title: 'Non-invasive blood pressure measurement utilising pulse transit time techniques'   |

#### *Completed PhD projects*

- |           |   |
|-----------|---|
| 2013-2016 | Mr K Budhida<br>Title: 'Investigation of photoplethysmograms and arterial oxygen saturation from the auditory canal in conditions of compromised peripheral perfusion'                            |
| 2013–2016 | Miss H Njoum<br>Title: 'Photoplethysmography in the assessment of blood flow and vascular mechanics'  |
| 2010-2014 | Miss Z Abdollahi<br>Title: 'Photoplethysmography and laser Doppler flowmetry for intraoperative assessment of bowel perfusion'  |
| 2010-2013 | Miss T Zaman<br>Title: 'Optical sensors for the in vivo assessment of flap perfusion in plastic surgery'  |
| 2009-2012 | Mr M Shafique<br>Title: 'Investigation of photoplethysmography and arterial blood oxygen saturation during artificially induced peripheral hypoperfusion utilising multimode photometric sensors' |

## ADMINISTRATION AND EXTERNAL ACTIVITIES

### University Administrative Positions

- 2016-Present Deputy Director, Research Centre for Biomedical Engineering
- 2014-Present Programme Director, MEng/BEng in Biomedical Engineering
- 2016-Present Chair, Departments of Engineering Research Ethics Committee
- 2016-Present Member, Senate Research Ethics Committee
- 2012-Present Electronic and Electrical Engineering Examinations Co-ordinator
- 2010-2014 Programme Director, MSc in Biomedical Engineering

### External Activities

- 2016–Present Editorial Board Member: Biomedical Physics and Engineering Express (IoP Journals)
- 2014-2015 Examiner, City and Guilds, London, UK.
- 2009–2012 Member, Physiological Measurement Special Interest Group, IPEM 2009

### Journal Reviewing

- Scientific Reports (Nature)
- Journal of Biomedical Optics (SPIE)
- Physiological Measurement (IoP)
- Biomedical Physics and Engineering Express (IoP)
- Journal of Clinical Monitoring and Computing (Springer)
- Measurement (Elsevier)
- Sensors (IEEE)
- Transactions on Biomedical Engineering (IEEE)

### Professional memberships

- Institute of Physics (IoP)
- Institute of Physics and Engineering in Medicine (IPEM)
- Institute of Electrical and Electronic Engineering (IEEE)

## PUBLICATIONS

### Summary

- Total number of publications: 54;
- Cumulative citations: 126;
- H-index: 8

### Books

*Physics in Anaesthesia: for FRCA candidates, ODPs and nurse anaesthetists*, B Middleton, J Phillips, S Stacey, R Thomas, Oxford: Scion Publishing, 2012.

### Peer-reviewed Journals

Davenport JJ, Hickey M, Phillips JP, Kyriacou PA 'Fiber-optic fluorescence-quenching oxygen partial pressure sensor using platinum octaethylporphyrin', *Applied Optics*, 55(21), 2016.

Davenport JJ, Hickey M, Phillips JP, Kyriacou PA 'Method for producing angled optical fiber tips in the laboratory', *Optical Engineering*, 55(2), 2016.

Hemon MC and Phillips JP, 'Comparison of foot finding methods for deriving instantaneous pulse rates from photoplethysmographic signals', *Journal of Clinical Monitoring & Computing*, 24, 2016.

Hickey M, Phillips JP, Kyriacou PA, 'Investigation of peripheral photoplethysmographic morphology changes induced during a hand-elevation study', *Journal of Clinical Monitoring & Computing*, 29, 2015.

Z Abdollahi, MA Thaha, A Ramsanahie, S Ahmed, 'Performance of a novel optical sensor for intraoperative assessment of intestinal viability proof of principle study' *Gut*, 64:A47-A48, 2015.

Cibert-Goton V, Phillips JP, Shortland PJ, 'Vascular changes associated with spinal root avulsion injury', *Somatosensory and Motor Research*, 22:1-5, 2015.

Hickey M, Phillips JP, Kyriacou PA, 'The effect of vascular changes on the photoplethysmographic signal at different hand elevations', *Physiological Measurement*, 36(3): 425-440, 2015.

Phillips JP, Cibert-Goton V, Langford RM, Shortland PJ, 'Perfusion assessment in rat spinal cord tissue using photoplethysmography and laser Doppler flux measurements', *Journal of Biomedical Optics* 18(3):037005, 2013.

Phillips J.P., Hickey M., Kyriacou P.A., 'Evaluation of Electrical and Optical Plethysmography Sensors for Noninvasive Monitoring of Hemoglobin Concentration', *Sensors*, 12(2), 2012.

Phillips, J. P., Kyriacou, P. A., Jones, D. P., Langford, R. M., & Chang, S. H. 'Photoplethysmographic measurements from the esophagus using a new fiber-optic reflectance sensor.' *Journal of Biomedical Optics*, 16(077005), 2011.

Chang SH, Maney, K, Phillips JP, Langford RM, 'A comparison of the respiratory effects of oxycodone versus morphine: a randomised, double-blind, placebo-controlled investigation'. *Anaesthesia* 65(10): 1007-1012, 2010.

Phillips, J. P., Langford, R. M., Chang, S. H., Maney, K., Kyriacou, P. A., & Jones, D. P. 'Cerebral arterial oxygen saturation measurements using a fiber-optic pulse oximeter' *Neurocrit Care*, 13(2), 278-285, 2010.

Phillips, J. P. 'Monitoring brain oxygenation in head-injury patients' *Critical Reviews in Biomedical Engineering*, 37(1-2), 107-137, 2009.

Phillips, J. P., Langford, R. M., Kyriacou, P. A., & Jones, D. P. 'Preliminary evaluation of a new fibre-optic cerebral oximetry system' *Physiol Meas*, 29(12), 1383-1396, 2008.

Phillips, J. P., Kyriacou, P. A., Jones, D. P., Shelley, K. H., & Langford, R. M. (2008, December). 'Pulse oximetry and photoplethysmographic waveform analysis of the esophagus and bowel' *Curr Opin Anaesthesiol*, 21(6), 779-783, 2008.

Phillips, J. P., Kyriacou, P., Jones, D. P., Chang, S. H., Maney, K., & Langford, R. M. 'Preliminary evaluation of a fiber optic cerebral oximetry system in patients undergoing neurosurgery' *Anesthesia and Analgesia*, 105, S113, 2007.

Phillips, J. P., Langford, R. M., Kyriacou, P. A., & Jones, D. P. 'Optical fibre catheter photoplethysmograph'. *Measurement and Control*, 39(3), 84-87, 2007.

### Submitted Journal Articles

A. M. Belhaj, J. P. Phillips, P. A. Kyriacou, and R. M Langford, 'Comparison of non-invasive peripheral venous saturations with venous blood co-oximetry' *Journal of Clinical Monitoring and Computing* [Submitted May 2016].

Abdollahi Z, Thaha M, Ramsanahie A, Ahmed A, Kyriacou PA, Phillips, JP 'Intraoperative assessment of intestinal viability using a combined photoplethysmography and laser Doppler flowmetry probe' *Journal of Clinical Monitoring and Computing* [Submitted July 2016].

Chatterjee S, Phillips JP and Kyriacou PA 'Monte Carlo investigation of the effect of blood volume and oxygen saturation on optical path in reflectance pulse oximetry' *Biomedical Optics Express* [Submitted July 2016].

### Abstracts

S. Chatterjee, J.P. Phillips, P.A. Kyriacou (2015). Differential pathlength factor estimation for brain-like tissue from a single-layer Monte Carlo model, *Conf Proc IEEE Eng Med Biol Soc.*, Milan, 2015.

Z. Abdollahi, P.A. Kyriacou, J. P. Phillips (2015). Evaluation of the optical interference in a combined measurement system used for assessment of tissue blood flow, *Proc. SPIE. 9315, Design and Quality for Biomedical Technologies VIII*.

Hickey M, Phillips JP, Kyriacou PA (2015). Venous pooling and drainage affects photoplethysmographic signals at different vertical hand positions, *Proc. SPIE. 9332, Optical Diagnostics and Sensing XV: Toward Point-of-Care Diagnostics*.

Phillips J, Kyriacou PA (2014). Comparison of methods for determining pulse arrival time from Doppler and photoplethysmography signals, *Conf Proc IEEE Eng Med Biol Soc.*, Chicago.

Abdollahi Z, Phillips J, Kyriacou PA. (2013). Evaluation of a combined reflectance photoplethysmography and laser Doppler flowmetry surface probe, *Conf Proc IEEE Eng Med Biol Soc.*, Osaka, 2013; 2013:1728-1731.

Phillips J, Belhaj A, Langford R, Kyriacou PA. Effect of respiratory-induced intensity variations on finger SpO<sub>2</sub> measurements in volunteers, *Conf Proc IEEE Eng Med Biol Soc.*, Osaka, Japan.

Phillips JP, Belhaj A, Shafqat K, Langford RM, Shelley KH, Kyriacou PA, (2012), Modulation of finger photoplethysmographic traces during forced respiration: Venous blood in motion?, *Conf Proc IEEE Eng Med Biol Soc.*, San Diego, 3644 – 3647.

Phillips, J. P., Belhaj, A., Shafqat, K., Langford, R.M, Shelley, K., Kyriacou, P.A. (2012). Modulation of Finger Photoplethysmographic Traces During Forced Respiration: Venous Blood in Motion? In *Conf Proc IEEE Eng Med Biol Soc.*, San Diego.

Phillips, J. P. & Kyriacou, P., (2011). Photoplethysmographic sensors for perfusion measurements in spinal cord tissue. In *J. Phys.: Conf. Ser. 307: Sensors and their Applications XV, Cork, ROI*.

Phillips, J. P., Kyriacou, P., & Hickey, M. (2011). Electro-optical Plethysmography for Non-invasive Estimation of Hemoglobin Concentration. In *Conf Proc IEEE Eng Med Biol Soc*, Boston.

Vesamia SA, Shah SM, Phillips JP, Randive NR, Langford RM, Greenwald SE, 'Comparison of aortic and aorto-femoral pulse wave velocity measured using continuous wave Doppler ultrasound', *Proceedings of the Anaesthetic Research Society (British Journal of Anaesthesia)*, 105, 727-727.

Phillips, J. P., Kyriacou, P. A., & Jones, D. P. (2010). Calculation of photon path changes due to scatter in Monte Carlo simulations, *Conference proceedings: Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Conference*, 4959-4962, Minneapolis, MN.

Phillips, J. P., Kyriacou, P. A., & Jones, D. P. (2010). Calculation of photon path changes due to scatter in Monte Carlo simulations. *Conf Proc IEEE Eng Med Biol Soc, 2010*, 4959-4962, Minneapolis, MN.

Shafique, M., Phillips, J. P., & Kyriacou, P. A. (2010). Evaluation of a multimode photoplethysmographic sensor during cuff-induced hypoperfusion, In *Conf Proc IEEE Eng Med Biol Soc Vol. 2010* (pp. 1024-1027), Minneapolis, MN.

Shafique, M., Phillips, J. P., & Kyriacou, P. A. (2010). Evaluation of a multimode photoplethysmographic sensor during cuff-induced hypoperfusion, *Conference proceedings: Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society, Minneapolis, MN*, 1024-1027.

Phillips, J.P., Kyriacou, P., Langford, R.M., & Jones, D.P. (2010). Fibreoptic Oesophageal Pulse Oximetry. In *Annual National Conference of the Institute of Physics and Engineering in Medicine (IPEM)* (pp. 73-74). Nottingham, UK.

Phillips, J. P., Kyriacou, P. A., George, K. J., & Langford, R. M. (2010). Optical measurement of blood flow changes in spinal cord injury. In *Journal of Physics: Conference Series Vol. 238*.

Shafique, M., Phillips, J. P., & Kyriacou, P. A. (2009). A novel non-invasive trans-reflectance photoplethysmographic probe for use in cases of low peripheral blood perfusion. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society* 1489-1492.

Shafique, M., Phillips, J. P., & Kyriacou, P. A. (2009). A novel non-invasive trans-reflectance photoplethysmographic probe for use in cases of low peripheral blood perfusion. In *Conf Proc IEEE Eng Med Biol Soc Vol. 2009* (pp. 1489-1492). United States.

Phillips, J. P., Langford, R. M., Chang, S. H., Maney, K., Kyriacou, P. A., & Jones, D. P. (2009). An oesophageal pulse oximetry system utilising a fibre-optic probe. In *Journal of Physics: Conference Series Vol. 178*.

Kyriacou, P., Shafique, M., & Phillips, J. P. (2009). Design and development of a new non-invasive trans-reflectance photoplethysmographic probe. In *Annual National Conference of the Institute of Physics and Engineering in Medicine (IPEM)*. Liverpool, UK.

Phillips, J. P., Langford, R. M., Chang, S. H., Maney, K., Kyriacou, P. A., & Jones, D. P. (2009). Evaluation of a fiber-optic esophageal pulse oximeter. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society: Engineering the Future of Biomedicine, EMBC 2009*, 1509-1512.

Phillips, J. P., Langford, R. M., Chang, S. H., Maney, K., Kyriacou, P. A., & Jones, D. P. (2009). Evaluation of a fiber-optic esophageal pulse oximeters, *Conf Proc IEEE Eng Med Biol Soc, 2009*, 1509-1512.

Phillips, J. P., George, K. J., Kyriacou, P. A., & Langford, R. M. (2009). Investigation of photoplethysmographic changes using a static compression model of spinal cord injury. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society: Engineering the Future of Biomedicine, EMBC 2009*, 1493-1496.

Phillips, J. P., George, K. J., Kyriacou, P. A., & Langford, R. M. (2009). Investigation of photoplethysmographic changes using a static compression model of spinal cord injury, In *Conf Proc IEEE Eng Med Biol Soc* Vol. 2009 (pp. 1493-1496). United States.

Phillips, J. P., Langford, R. M., Chang, S. H., Maney, K., Kyriacou, P. A., & Jones, D. P. (2009). Measurements of cerebral arterial oxygen saturation using a fiber-optic pulse oximeter. In *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society: Engineering the Future of Biomedicine, EMBC 2009* (pp. 1513-1516).

Nikolic, S., Mehta, V., Ratcliffe, S., Phillips, J. P., Kyriacou, P. & Langford, R. M. (2008). A prospective, randomised, double-blind, double-dummy, placebo-controlled trial to assess the respiratory effects of buprenorphine versus morphine in anaesthetised patients. In *The 14th World Congress of Anaesthesiologists*. Cape Town, S Africa.

Phillips, J. P., Langford, R. M., & Jones, D. P. (2007). Investigation of an optical fiber cerebral oximeter using a Monte Carlo model. *Annual International Conference of the IEEE Engineering in Medicine and Biology - Proceedings*, 1113-1116.

Phillips, J. P., Kyriacou, P. A., Chang, S. H., Maney, K., George, K. J., & Langford, R. M. (2007). Photoplethysmographic measurements from central nervous system tissue. In *Journal of Physics: Conference Series* Vol. 85.

Phillips, J. P., Kyriacou, P. A., George, K. J., Priestley, J. V., & Langford, R. M. (2006). An optical fiber photoplethysmographic system for central nervous system tissue, *Conf Proc IEEE Eng Med Biol Soc*, 1, 803-806.

Phillips, J. P., Kyriacou, P. & Langford, R. M. (2006). Calibration of an optical fibre cerebral oximeter using a Monte Carlo model. In *Proceedings of the 12th Annual Scientific Meeting of the Institute of Physics and Engineering in Medicine*.

Phillips, J. P., Langford, R. M., Kyriacou, P & Jones, D. P. (2004). Optical Fibre Catheter Photoplethysmography. In *The X Mediterranean Conference on Medical and Biological Engineering and Computing (MEDICON 2004)* (pp. 1-4). Ischia, Italy.

## Patents

### *Pending*

P003049WO – PCT Request Filed 2016 - Optical Monitoring System & Sensor Therefor; Inventors: PHILLIPS JUSTIN P (GB); KYRIACOU PANICOS A (GB), HICKEY MICHELLE (GB), DAVENPORT JOHN J (GB).

GB1600314.7 – Preliminary Filing 2016 – A Noninvasive system for continuous monitoring of intracranial pressure; Inventors: PHILLIPS JUSTIN P (GB).

### *Granted*

GB1000532.0 – Method for monitoring blood components; Inventors: PHILLIPS JUSTIN P (GB); KYRIACOU PANICOS A (GB).

WO2005060825: Optical Fibre Catheter Pulse Oximeter. Inventors: PHILLIPS JUSTIN P (GB); LANGFORD RICHARD M (GB); JONES DERIC P (GB); KYRIACOU PANICOS A (GB).