

# Christos Bergeles, Ph.D.

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Highly skilled engineer with extensive experience on algorithms, and medical robots and devices. Managed several teams of engineers, and clinicians on research projects, spearheaded fund-raising through foundations, industry, and research institutions. Currently establishing my own research group on microsurgical robotics and image-guided therapies as an assistant professor.

## EXPERTISE

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Medical Devices and Robots; Medical Imaging.

## EMPLOYMENT

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### University College London

Sep. 2015 – Today

#### Lecturer (Assistant Professor), Translational Imaging Group, Dep. Medical Physics and Bioengineering –

- Research and development of a force-perceptive flexible robot for vitrectomy-less subretinal stem cell delivery.
- Research and development of neuromorphic imaging systems for minimally invasive surgery and ophthalmoscopy.
- Teaching Clinical Engineering to Bioengineering BSc/MSc students.

### Imperial College London

May 2013 – Aug. 2015

#### Hamlyn Research Fellow at the Hamlyn Centre for Robotic Surgery –

- Used project management tools to guide the design and implementation of a flexible access robot for highly dextrous vitreoretinal surgery including mechatronics (Solidworks) and software (C++).
- Guided the design and implementation of a liquid-lens-based hand-held ophthalmoscope for developing countries, using optical simulations software and Solidworks.
- Developed software (C++, VTK, Matlab) for incorporating endomicroscopy information with multiview stereo endoscopy for augmented surgical reality.

### Respi Inc.

Sep. 2013 – Today

#### CTO & Co-Founder –

- Managing for smartphone-enabled spirometer prototyping and calibration using Matlab and Solidworks.
- Leader of spirometry algorithm prototyping in Matlab and C++.
- Supervisor of academic community engagement to increase worldwide visibility and collaborations.

### Boston Children's Hospital, Harvard Medical School

Jan. 2012 – May 2013

#### Research Fellow at the Department of Cardiovascular Surgery –

- Researched surgery-specific designs of flexible robots for neurosurgery using simulation tools developed in Matlab.
- Developed software in C for tracking and control of robots that are powered through the MRI scanner.

### ETH Zurich

Mar. 2011 – Dec. 2011

#### Post-Doctoral Researcher at the Multiscale Robotics Lab –

- Managed clinicians and engineers for the *in vivo* evaluation of our intraocular microrobotics drug delivery platform.

## SKILLS

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### Medical Image Processing

- Extensive experience with intraoperative imaging modalities (endoscopy, fluoroscopy) through R&D activities.
- Knowledge MRI image processing, and MRI programming through my post-doctoral research.

### Software Engineering

- Excellent knowledge of C++ for software engineering projects ranging from mechanical simulations to image processing.
- Proficiency in C, including memory handling, gained through MRI programming projects in Linux.
- Good knowledge of data structures, including hash-tables, trees, dictionaries, and their algorithmic implications.
- Code management through GIT, SVN, and online task-allocation tools such as Asana.

### Management and Leadership

- Managing cross-disciplinary projects between clinicians and engineers, acquired through the spearheading of animal trial experiments and surgical robotics projects.
- Managing engineers of all levels through my start-up company, Respi, and through my academic appointments, all in the domain of medical devices/robots.

### Innovation

- Entrepreneurial experience as exhibited in the success of my start-up company and the multitude of academic projects I have conceived and led.
- Experience in patent writing and patent application acquired through my awarded patent in ophthalmoscopy.

## QUALIFICATIONS

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### Medical Device CE Marking Training

2015

Medical Device CE Marking training from BSI Training Group, UK.

### ETH Zurich, PhD

Oct. 2006 – Mar. 2011

DSC (PhD) degree, topic: “Visually Servoing of Wireless Magnetic Intraocular Microrobots”.

### National Technical University of Athens, Dipl-Ing

Oct. 2001 – Jul. 2006

MSc, School of Electrical and Computer Engineering, thesis topic: “Tracking Moving Objects with Emphasis on Human Hands”.

### Microsoft C# Certification

2005

C# certification from Microsoft Hellas.

## AWARDS IN THE LAST FIVE YEARS

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2015 IEEE Trans. Automation Science and Engineering Best Paper Award for “Robust electromagnetic control of microrobots under force and localization uncertainties”.

2014 Fight for Sight Award, UK, for Research in Ophthalmology.

2014 Best Oral Paper Finalist at Hamlyn Symposium, UK, for Multiscale Image Fusion in Transanal Endoscopic Microsurgery.

2014 Best Student Paper Finalist for my mentee Charalampos Michailidis at Int. Conf. Wireless Mobile Communication and Health.

2013 2<sup>nd</sup> Place at SFEE Innovation Competition for Respi.

2013 Best Medical Robotics Paper Finalist for “Commutator-Control of an MRI-Powered Robot Actuator” at IEEE ICRA.

2011 Best Medical Robotics System Paper Finalist for “Steerable Intravitreal Inserts” at MICCAI.

2011 Best Computer Vision Paper Finalist for “Model-Based Localisation of Intraocular Microdevices” at IEEE ICRA.

## JOURNAL PUBLICATIONS

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- [1] O. Felfoul, A. Becker, C. Bergeles, and P. E. Dupont, “Achieving Commutation Control of an MRI-Powered Robot Actuator,” IEEE Trans. Robotics, vol. 31, no. 2, pp. 387-399, 2015.
- [2] C. Bergeles, A. Gosline, N. Vasilyev, P. Codd, P. J. del Nido, and P. E. Dupont, “Concentric Tube Robot Design and Optimization Based on Task and Anatomical Constraints,” IEEE Trans. Robotics, vol. 31, no. 1, pp. 67-84, 2015.
- [3] C. Bergeles, and G.-Z. Yang, “From Passive Tool Holders to Microsurgeons: Safer, Smaller, Smarter Surgical Robots,” IEEE Trans. Biomedical Engineering, vol. 61, no. 5, pp. 1565-1576, 2014.
- [4] H. Marino, C. Bergeles (co-first), and B. J. Nelson, “Robust electromagnetic control of microrobots under force and localization uncertainties,” IEEE Trans. Automation Science and Engineering, vol. 11, no. 1, pp. 310–316, 2014.
- [5] P. Vartholomeos, C. Bergeles, L. Qin, and P. E. Dupont, “An MRI-powered and controlled actuator technology for tetherless robotic interventions,” vol. 32, no. 13, pp. 1536-1552, 2013.
- [6] F. Ulrich, C. Bergeles, J. Pokki, O. Ergeneman, S. Erni, G. Chatzipirpiridis, S. Pané, C. Framme, and B. J. Nelson, “Mobility Experiments with Microrobots for Minimally Invasive Intraocular Surgery,” Investigative Ophthalmology and Visual Science, vol. 54, no. 4, pp. 2853-2863, 2013.
- [7] C. Bergeles, B. E. Kratochvil, and B. J. Nelson, “Visually servoing magnetic intraocular microrobots,” IEEE Trans. Robotics, vol. 28, no. 4, pp. 798–809, 2012.
- [8] C. Bergeles, K. Shamaei, J. J. Abbott, and B. J. Nelson, “Single-camera focus-based localization of intraocular devices,” IEEE Trans. Biomedical Engineering, vol. 57, no. 8, pp. 2064–2074, 2010.
- [9] L. Zhang, J. J. Abbott, K. Peyer, B. E. Kratochvil, H. Zhang, C. Bergeles, and B. J. Nelson, “Characterizing the swimming properties of artificial bacterial flagella,” Nano Letters, vol. 9, no. 10, pp. 3663–3667, 2009.

## INTERNATIONAL REFEREED CONFERENCE PUBLICATIONS IN THE LAST YEAR (20 TOTAL)

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- [1] C. Bergeles, P. Berthet-Rayne, P. McCormac, L. C. Garcia-Peraza-Herrera, K. Onyenso, F. Cao, K. Vyas, M. Berthelot, and G.-Z. Yang, “Accessible digital ophthalmoscopy based on liquid-lens technology,” Int. Conf. Medical Image Computing and Computer Assisted Intervention (MICCAI), pp. 571-578, 2015.
- [2] F.-Y. Lin, C. Bergeles, and G.-Z. Yang, “Biometry-based concentric tubes robot for vitreoretinal surgery,” IEEE Engineering in Medicine and Biology Conf. (EMBC), 2015, in press.
- [3] K. Leibrandt, C. Bergeles, and G.-Z. Yang, “On-line collision-free inverse kinematics with frictional active constraints for effective control of unstable concentric tube robots,” IEEE/RSJ Int. Conf. Intelligent Robots and Systems (IROS), 2015, in press.
- [4] A. Vandini, C. Bergeles, F.-Y. Lin, and G.-Z. Yang, “Intraoperative vision-based shape sensing of concentric tube robots,” IEEE/RSJ Int. Conf. Intelligent Robots and Systems (IROS), 2015, in press.
- [5] M. Power, H. Rafi-Tari, C. Bergeles, V. Vitiello, and G.-Z. Yang, “A cooperative control framework for haptic guidance with bimanual surgical tasks based on learning from demonstration,” IEEE Int. Conf. Robotics and Autom. (ICRA), pp. 5330-5337, 2015.

## OTHER

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**Memberships:** IEEE Robotics and Automation (2004 – now); IEEE Engineering in Medicine and Biology (2006 – now).  
**Language:** Fluent in English, intermediate in French, beginner in German / mother-tongue: Greek.  
**Interests:** Photography, Miniature Painting, Piano.