## Hamlyn Symposium 2014 Programme

**Sunday 13th July 2014**

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<td>08:30</td>
<td>Registration and Coffee</td>
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<td>09:15</td>
<td>Welcome (Guang-Zhong Yang)</td>
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<td>09:20</td>
<td>Opening Address (Ara Darzi)</td>
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### Session 1 - From Exo-Skeletons to Surgical Robots

*Chairs: Leo Joskowicz, Lee Swanstrom*

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| 09:30 | Invited Lecture: Homayoon Kazerooni, Berkeley University of California, USA  
*New Developments on Lower Extremity Exoskeleton Systems* |
| 10:15 | Quantifying Innovation in Robotic Surgery  
A. Hughes-Hallett\(^2\), E. Mayer\(^2\), P. Pratt\(^1\), J. Vale\(^2\), A. Darzi\(^{1,2}\)  
\(^1\)The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK  
\(^2\)Department of Surgery and Cancer, Imperial College London, UK |
| 10:30 | Identification of Non-technical Roadblocks in Cognitive Robotic Surgery  
E. Bergés\(^1\), A. Casals\(^1,2\)  
\(^1\)Institute of Bioengineering of Catalonia, IBEC, Spain  
\(^2\)Technical University of Catalonia, UPC, Spain |
| 10:45 | A Framework for Multilateral Manipulation in Surgical Tasks  
K. A. Nichols*, A. Okamura  
*Department of Mechanical Engineering, Stanford University, USA* |
| 11:00 | Realisation of Robotics in Spinal Surgery  
M. Shoham*  
*Robotic Laboratory, Technion - Israel Institute of Technology, Israel* |
| 11:15 | Coffee Break and Poster Session                                       |
11:45  Poster Teaser Session 1 (3 minute presentations)

Chairs: Julian Teare, Colin Bicknell

P1 ROS GPU Acceleration Framework for Image Guided Surgical Robots
F. Liu*, G. Sison, F. Rodriguez Y Baena
Mechanical Department, Imperial College London, UK

P2 Evaluation of a Novel EM Tracking System in a Breathing Lung Model
K. O'Donoghue*¹, A. Corvo¹, P. Nardelli¹, C. O'Shea¹, K. A. Kahn³, M. Kennedy², P. Cantillon-Murphy¹
¹School of Engineering, University College Cork, Ireland
²Department of Pulmonology, Cork University Hospital, Ireland

P3 The Face, Content and Construct Validity of a FAST Phantom
M. Chaudery*, J. Clark¹, D. Apdafydd², J. Dunn², G.-Z. Yang¹, A. Darzi¹,²
¹The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
²St Marys Hospital, Imperial College Healthcare NHS Trust, UK

P4 Prototype Design of Flexi-Hand for Single Incision Laparoscopic Surgery
G. K. Zhang, S. X. Wang*, J. M. Lin, Y. Y. Sun, Y. Xing
Key Lab for Mechanism Theory and Equipment of Ministry of Education, Tianjin University, China

P5 Shedding Light on Surgeons’ Cognitive Resilience: A Novel Method of Topological Analysis for Brain Networks
M. Kiani*¹, J. A. Perez¹, D. R. Leff², A. Darzi¹, G.-Z. Yang¹,²
¹The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
²Department of Surgery and Cancer, Imperial College London, UK

P6 Instrument-Based Registered Strain Imaging for Remote Palpation in Robot-Assisted Laparoscopic Surgery
O. Mohareri*, C. Schneider, S. E. Salcudean
Robotics and Control Laboratory, University of British Columbia, Canada

P7 Why LopeRA Failed to Recruit? A Qualitative Study.
R. Jalil*², E. Mayer², N. Sevdalis², E. Hall³, J. S. Green⁴, J. Vale², A. Darzi¹,²
¹The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
²Department of Surgery and Cancer, Imperial College London, UK
³The Institute of Cancer Research, London, UK
⁴Barts Healthcare NHS Trust, London, UK
P8  A Study of Socially Acceptable Movement for Assistive Robots Concerning Personal and Group Workspaces  
J. Correa*, S. McKeague, J. Liu, G.-Z. Yang  
The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

P9  Paediatric Robot-Assisted Laparoscopic Heminephroureterectomy  
S. P. Rowland*¹, T. P. Cundy¹², J. A. Harikrishnan¹, A. S. Najmaldin¹  
¹Department of Paediatric Surgery, Leeds General Infirmary, UK  
²The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

P10  Real-Time Modelling of Intra-operative Brain Shift Based on Video Tracking  
I. Rasin¹, Z. Pekar³, O. Sadowsky², A. E. Forte³, S. Galvan³, D. Dini³, M. Shoham⁴, L. Joskowicz²  
¹Avtech Scientific, Modiin Illit, Israel.  
²School of Engineering and Computer Science, The Hebrew Univ. of Jerusalem, Israel.  
³Department of Mechanical Engineering, Imperial College London, UK  
⁴Faculty of Mechanical Eng. Technion - Israel Institute of Technology, Haifa, Israel

H. J. Marcus*¹², A. Hughes-Hallett¹, T. P. Cundy¹, G.-Z. Yang¹, D. Nandi¹, A. Darzi¹  
¹The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK  
²Department of Neurosurgery, Imperial College Healthcare NHS Trust, UK

P12  Pre-Operative Planning of Femoral Neck Fractures: A Tool for Accuracy  
A. Tsanaka*¹, P. Tarassoli², S. Dogramadzi²  
¹Bristol Robotics Laboratory, UK  
²Department of Trauma and Orthopaedics, University Hospital Bristol NHS Trust, UK

12:45  Lunch and Poster Session

Session 2 - Haptics and Teleoperation

Chairs: Gabor Fichtinger, Rick Satava

14:30  Invited Lecture: Rajni Patel, CSTAR, Canada  
Teleoperation and Haptics in Medical Robotics

15:15  Multi-Fingered Palpation using Pseudo-Haptic Feedback  
M. Li*¹, S. Sareh¹, L. D. Seneviratne¹, P. Dasgupta³, H. Wurdemann¹, K. Althoefer¹  
¹Centre for Robotics Research, King’s College of London, UK  
³MRC Centre for Transplantation, DTIMB and NIHR BRC, King’s College London, UK

15:30  Development of a Force-Sensing System for Endoscopic Submucosal Dissection
15:45 **Demonstration of Autonomous Atraumatic Cochleostomy by Combined Advanced Surgical Robot Systems**  
S. Weber¹, B. Bell¹, N. Gerber¹, T. Williamson¹, P. Brett², X. Du*², M. Caversaccio³, D. Proops⁴, C. Coulson⁴, A. Reid⁴  
¹Brunel Institute for Bioengineering, Brunel University Hospital, UK  
²ARTORG Centre, University of Bern, Switzerland  
³Department of ENT, Head of Neck Surgery, Bern University Hospital, Switzerland  
⁴Department of Otolaryngology, Queen Elizabeth Hospital, UK

16:00 **Robotic versus Non-Robotic Instruments for Minimally Invasive Surgery in Spatially Constrained Operative Workspaces**  
T. P. Cundy*¹, H. J. Marcus¹, A. Hughes-Hallett¹, T. MacKinnon¹, K. Shetty¹, A. S. Najmaldin⁵, G.-Z. Yang¹, A. Darzi¹  
¹The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK  
⁵Department of Paediatric Surgery, Leeds General Infirmary, UK

16:15 Coffee Break and Poster Session

**Session 3 - From Rehabilitation to Surgical Training**

**Chairs: Dennis Fowler, Azad Najmaldin**

16:45 **Invited Lecture: Robert Riener, ETH Zurich, Switzerland**  
Robots can outperform conventional therapy

17:00 **A Haptic Simulator for Upper Gastrointestinal Endoscopy**  
S. Chakravarthy*, A. M. Rao, G.K. Ananthasuresh  
Mechanical Engineering, Indian Institute of Science, Bangalore, India

17:15 **Computational Simulations of Airflow in Tracheal Compression due to Retrosternal Goitre**  
R. Cetto*¹,², A. J. Bates¹, A. P. Comerford¹, G. Madani³, D. J. Doorly¹, N. S. Tolley²  
¹Department of Aeronautics, Imperial College London, UK  
²Department of Endocrine Surgery, Imperial College Healthcare NHS Trust, UK  
³Department of Clinical Radiology, Imperial College NHS Healthcare Trust, UK
17:30 Development of a Dynamic Soft Tissue Phantom for Cooperative Control Testing in Robotic Surgery
M. Cattilino\(^1\), R. Secoli\(^2\), S. Galvan\(^2\), A. E. Forte\(^2\), D. Dini\(^2\), F. Rodriguez y Baena*\(^2\)
\(^1\)Department of Mechanical and Aerospace Engineering, Polytechnic of Turin, Italy
\(^2\)Department of Mechanical Engineering, Imperial College London, UK

17:45 Trainee Learning Curve for Transoral Surgery with a Novel Flexible Endoscopic Surgery System
D. Clayburgh\(^1\), N. Godse\(^1\), H. Choset\(^2\), U. Duvvuri*\(^1\)
\(^1\)Veterans Affairs Pittsburgh Health System, Department of Otolaryngology, University of Pittsburgh, USA
\(^2\)Biorobotics Laboratory, Carnegie Mellon University, USA
**Monday 14th July 2014**

**08:45** Registration and Coffee

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**Session 4 - Micro, Nano and Flexible Access Robots**

*Chairs: Cameron Riviere, Geoff Pegman*

**09:15** Keynote Lecture: Toshio Fukuda, Nagoya University, Japan

*Single Cell Analysis and Assembly by Micro and Nano Robotics System*

**10:00** Concentric Tube Robots for Transurethral Prostate Surgery: Matching the Workspace to the Endoscopic Field of View

R. J. Hendrick*1, C. R. Mitchell1, S. D. Herrell2, R. J. Webster III1

1Department of Mechanical Engineering, Vanderbilt University Medical Centre, USA

2Department of Urologic Surgery, Vanderbilt University Medical Centre, USA

**10:15** Design and Evaluation of a Concentric Tube Robot for Minimally-Invasive Endoscopic Paediatric Neurosurgery

V. Bodani*1,2, H. Azimian1, T. Looi1, J. M. Drake1,2

1Centre for Image Guided Intervention and Therapeutic Innovation, The Hospital for Sick Children, Toronto, Canada

2Department of Neurosurgery, University of Toronto, Canada

**10:30** A Master Slave Y-type Single Port Laparoscopic Surgery Robot with High Force Transmission and Large Workspace

S. Shim*1, D. Ji1, J. Arata2, M. Hashizume2, J. Hong1

1Department of Robotics Engineering, Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea

2Faculty of Medical Sciences, Kyushu University, Fukuoka, Japan

**10:45** Augmented Instrument Control for the CYCLOPS Robotic System

V. Vitiello*, T. P. Cundy, A. Darzi, G.-Z. Yang, G. P. Mylonas

The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

**11:00** Coffee Break and Poster Session

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**11:30** Poster Teaser Session 2 (3 minute presentations)

*Chairs: Len Fass, Ferdinando Rodriguez Y Baena*

**P13** Origami-Inspired SMA Actuated Constant Velocity Coupling for Dexterous Telesurgical Robot and Self-Morphing Medical Robots

K. Zhang*1, M. Salerno1, J. S. Dai1
P14  MRI-Compatible Needle Positioner for Laser Ablation of the Liver: Preliminary Evaluation in a 3T MRI Scanner
E. Franco*, M. Ristic
Department of Mechanical Engineering, Imperial College London, UK

P15  Fluidic Actuators for Minimally Invasive Neurosurgical Instruments
K. Eastwood*1,2, T. Loqi1,2, H. E. Naguib1, J. Drake1,2
1Neurosciences and Mental Health, The Hospital for Sick Children,
2Institute for Biomaterials and Biomedical Engineering, University of Toronto

P16  Preliminary Development of a Novel Amphibious Locomotion System for Use in Inter-Luminal Surgical Procedures
W. Mayfield*, A. Alazmani1, A. Hood1, J. Boyle1, P. Culmer1, R. Hewson1, A. Neville1, D. Jayne2
1School of Mechanical Engineering, University of Leeds, UK
2Leeds Academic Surgical Unit, St James’ University Hospital, UK

P17  3D Motion Planning for Steerable Needles using Path Sets
S. Sanan1, Y. Chen1, C. A. Lehocky2, C. Gong1, C. N. Riviere*1,2, H. Choset1
1The Robotics Institute, Carnegie Mellon University, USA
2Biomedical Engineering, Carnegie Mellon University, USA

P18  A Bio-inspired Flexible Robot with Hybrid Actuation Mechanisms for Endoscopic Surgery
1Department of Surgery, The Chinese University of Hong Kong
2Department of Mechanical and Automation Engineering, University of Hong Kong

P19  Design of a Bi-Manual End-Effecter for an Endoscopic Surgical Robot
C. A. Seneci*, J. Shang, G.-Z. Yang
The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK

P20  Ontology-Based Modular Architecture for Surgical Autonomous Robots
R. Perrone*, F. Nessi1, E. De Momi1, F. Boriero1, M. Capiluppi2, P. Fiorini2, G. Ferrigno1
1Department of Electronics, Information and Bioengineering (DEIB), Politecnico di Milano, Italy
2Department of Computer Science, University of Verona, Italy

P21  Success and Limitations of Robotic Surgery in Infants
T. P. Cundy*, S. P. Rowland1, N. K. Alizai2, A. S. Najmaldin2
1The Hamlyn Centre for Robotic Surgery, IGHI, Imperial College London, UK
P22  Investigation of Performance Log Files of Freehand SPECT Acquisitions for Usage Characteristics and Surgical Phase Determination
A. Okur*1,2, R. Voigt1, R. Stauder1, N. Navab1
1Computer Assisted Medical Procedures, Technical University of Munich, Germany
2Department of Nuclear Medicine, Technical University of Munich, Germany

P23  Detecting and Analysing the Surgical Workflow to Aid Human and Robotic Scrub Nurses
R. Stauder*, A. Okur, N. Navab
Computer Assisted Medical Procedures, Technical University of Munich, Germany

12:30  Lunch and Poster Session

14:00  Panel Discussion and Debate
Chair: Guang-Zhong Yang

Session 5 - Image Guidance and Fusion

14:45  Accuracy Evaluation of Interventionsal Nuclear Tomographic Reconstruction using Mini Gamma Cameras
P. Matthies*1, J. Gardiazabal1, A. Okur1,2, T. Lasser1, N. Navab1
1Computer Aided Medical Procedures (CAMP), Technical University of Munich, Germany
2Department of Nuclear Medicine, Technical University of Munich, Germany

15:00  A Pilot Study of Augmented Reality from Intraoperative CBCT for Image-Guided Thoracic Robotic Surgery
W. P. Liu*, M. Azizian2, J. M. Sorger2, B. Mungo3, O. J. Wagner2, D. Molena3, R. H. Taylor1
1Computer Science, Johns Hopkins University, Baltimore, USA
2Intuitive Surgical Inc., Sunnyvale, USA
3Robotic and Minimally Invasive Thoracic Surgery, Johns Hopkins Hospital, Baltimore, USA

15:15  Intraoperative 3D Fusion of Microscopic and Endoscopic Images in Transanal Endoscopic Microsurgery
P. Giataganas, C. Bergeles*, P. Pratt, M. Hughes, A. Darzi, G.-Z. Yang
The Hamlyn Centre for Robotic Surgery, IGHL, Imperial College London, UK

15:30  Robotic Image-guidance of an MR-compatible Catheter for Left Atrium Ablation with Flattened Maps for Procedure Planning
R. Karim*, A. Ataollahi2, S. Wang2, J. Back2, H. Liu2, R. Razavi1, K. Althoefer2, T.
Schaeffter\textsuperscript{1}, K. Rhode\textsuperscript{1}
\textsuperscript{1}Division of Imaging Sciences and Biomedical Engineering, King's College London, UK
\textsuperscript{2}Centre for Robotics Research, Department of Informatics

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<td><strong>Session 6 - Tracking, Navigation and Open Platforms</strong></td>
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<td><strong>Chairs: Simon DiMaio, Justin Vale</strong></td>
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| 16:15 | Karl Storz - Harold Hopkins Lecture: Lee Swanstrom, Oregon Clinic, USA  
*Let's start again: creating a needs based robot for general surgery*
| 17:00 | Real-Time Electromagnetic Navigation for Breast Tumour Resection: Proof of Concept  
G. Gauvin\textsuperscript{1}, C. T. Yeo\textsuperscript{2}, T. Ungi\textsuperscript{2}, G. Fichtinger*\textsuperscript{2}, J. Rudan\textsuperscript{1}, C. J. Engel\textsuperscript{1}
\textsuperscript{1}Department of Surgery, Queen's University, Canada
\textsuperscript{2}School of Computing, Queen's University |
| 17:15 | Boosted Hybrid EM-Video Endoscopic Navigation Using Organ Centerline Constraint and Structural Measure under Tissue Deformation  
X. Luo*, U. L. Jayarathne, T. M. Peters  
Robarts Research Institute, Western University, London, Canada |
| 17:30 | Implementation of a Motion Planning Framework for the da Vinci Surgical System Research Kit  
Z. Zhang, A. Munawar, G. S. Fischer*  
Automation and Intervention Medicine (AIM) Robotics Research Laboratory, Worcester Polytechnic Institute, USA |
| 17:45 | da Vinci\textsuperscript{®} Auxiliary arm as a Robotic Surgical Assistant for Semi-autonomous Ultrasound Guidance during Robot-assisted Laparoscopic Surgery  
O. Mohareri*, S. E. Salcudean  
Robotics and Control Laboratory, University of British Columbia, Canada |
| 18:00 | Closing Remarks & Awards followed by Drinks Reception |
| 19:30 | Programme Committee Dinner |