



# Aston University

Engineering & Applied Science



## Rigorous, Relevant Research

## Biomedical Engineering

### ► Introduction

The Biomedical Engineering research group has four academic staff with international track-records of working with complex systems at the interfaces between engineering and medicine, biology, manufacturing and design. The research is led by established multi-disciplinary teams of engineers, surgeons, other medical professionals and industrial partners based internationally and locally. With an outward focus, the group produces innovative state of the art devices for use in surgery, medicine and rehabilitation as well as having research of a fundamental nature.

### ► Sponsors and funders

- EPSRC
- Industry
- Charitable organisations
- NHS
- UKIERI.

### ► Academic partners

- Local hospitals
- Imperial College, London
- Kings College, London
- Rutherford Labs
- University of Dundee
- Wanless Hospital, Miraj, India
- IIT Delhi, India.

### ► Key projects

- Medical devices including artificial heart implants, neurosensory devices (cochlear): from fundamental principles and interactions with the body through to product design and manufacture. The group has two in house, patented ventricular assist devices and collaborates internationally on a totally artificial heart.
- Robotics including micro-robotic surgical tools. Recently the advanced robotic micro-drill demonstrated that a fully autonomous surgical robotic device guided by the state of tissue/tool point interaction can be applied in theatre with great precision in flexible tissues.

- Smart sensing systems for discriminating tissues, cells on the micro scale.
- Human motion and behaviour including locomotion, in a world-class gait lab incorporating novel information sensing systems.
- Biomechanics including cell mechanics, computational and experimental bloodflow dynamics.

### ► Significant findings

- The first robotic surgical tool able to control tool point interaction in flexible tissues (successfully deployed in the operating theatre at Birmingham University Hospital for cochleostomy).
- The first disposable, micro-steerable endoscopic tool able to discriminate touch.
- A novel micro-fabricated passive cell device for the filtration of spermatozoa for fertility treatment.

### ► Recent publications

- Prince M, Ma X, Docker P, Ward M and Prewett P, 2007 "The development of a Novel Bio-MEMS Filtration Chip for the Separation of Specific Cells in Fluid Suspension" IMechE, Part H, Engineering in Medicine, 221, 113-128, 0954-4119.
- Elliott M, Ma X and Brett PN, 2007 "Tracking the position of a harmonically varying force moving along a plate using distributive sensing method" Int Journal of Sensors and Actuators, Part A, 0924-4247.
- Ma X, Vakakis AF and Bergman L, 2007 "Karhunen-Loeve analysis and order reduction of the transient dynamics of linear coupled oscillators with strongly nonlinear end attachments" J. of Sound and Vibration, 0022-460X.
- Elliott M, Ma X and Brett PN, 2007 "Determining The location of an Unknown Force Moving along a Plate Using the Distributive Sensing Method" Sensors and Actuators, part A. Physics, 0924-4247.

### Key contacts

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[www.esm.aston.ac.uk/research/system/medical/index.php](http://www.esm.aston.ac.uk/research/system/medical/index.php)