PROF. FERDINANDO RODRIGUEZ

/// Professor of Medical Robotics, Faculty of Engineering, Department of Mechanical Engineering

Imperial College London

Ferdinando Rodriguez y Baena is Professor of Medical Robotics in the Department of Mechanical Engineering at Imperial College, where he leads the Mechatronics in Medicine Laboratory. He has developed commercial systems for orthopaedic surgery (the Acrobot orthopaedic robot and the Navigator computer assisted surgery system, now of Stryker Inc.), as well as several surgical and pre-surgical prototypes, including a passive haptics system for orthopaedic surgical training, an advanced needle steering system (funded by the European Research Council), a unique cooperative controller for robot assisted soft tissue surgery (known as Dynamic Active Constraints), and novel registration algorithms and advanced biomechanics analysis for improved performance in joint replacement. In parallel work, he also leads research on the application of robotics to non-destructive evaluation, with an ongoing collaboration with Phoenix ISL ltd. on the development of a mobile platform for autonomous pipe inspection, and a snake-like system for on-wing jet inspection with Rolls Royce plc. He was an Associate Editor for the IEEE Robotics and Automation Magazine, and he is the Chair of the Programme Committee for the International Society for Computer Assisted Orthopaedic Surgery, the International Workshop on Medical Robotics and the Joint Workshop on New Technologies for Computer/Robot Assisted Surgery; he is also the Chair of the IET's Communities Committee for Technical and Professional Networks, a Leverhulme Prize winner (engineering), a former ERC grant holder, and the coordinator of an €8.3M European project on robotic-assisted neurosurgical drug delivery (www.eden2020.eu). He has published over 150 papers and has secured in excess of £10M in research funding to date. Prof Rodriguez y Baena recently cofounded Neoptera Surgical, a MedTech start up which specialises in precision robotic surgery for minimally invasive diagnostics and therapy, bolstered by proprietary bio-inspired technology.

Presentation Title

A Personal Take on Medical Robotics and Computer Assisted Surgery

DR. RICCARDO SECOLI

/// Research Associate, Faculty of Engineering, Department of Mechanical Engineering

Imperial College London

Riccardo Secoli received the MSEE in Computer Engineering (branch Control System Engineering) in 2006 and a PhD in Industrial Engineering with specialization in Mechatronics and Industrial System in 2010, both from the University of Padua (Italy). In 2009, he was a visiting PhD Student in the Biorobotics Lab (Dept. Mechanical and Aerospace Eng. - University of California Irvine - USA) where he joined as post-doc until 2011. He has been a Research Associate in the Mechatronics in Medicine Lab at Dept. Mechanical Eng. - Imperial College London since 2012.

Since 2018, he is a co-founder of Neoptera Surgical: a MedTech start-up specializes in precision robotic surgery for minimally invasive diagnostics and therapy, bolstered by proprietary bio-inspired technology.

PROF. CONSTANTIN-C. COUSSIOS

/// Director, Oxford Institute of Biomedical Engineering, Statutory Chair of Biomedical Engineering, Professorial Fellow of Magdalen College

University of Oxford

Professor Constantin Coussios (MEng, PhD Cantab.) is the Director of the Institute of Biomedical Engineering at the University of Oxford. He received the 2017 Silver Medal of the UK's Royal Academy of Engineering for his contributions to the translation of novel medical technologies into clinical practice. In 2008, he co-founded OrganOx Ltd., which developed the world's first normothermic liver perfusion device for organ preservation (Nature 2018). In 2014, he was the lead academic founder of OxSonics Ltd., which exploits nanobubbles for ultrasound-enhanced oncological drug delivery (Lancet Oncology 2018). In 2016, he co-founded OrthoSon Ltd., to enable minimally invasive intervertebral disc replacement.

Institute Profile

The Institute of Biomedical Engineering (IBME) at the University of Oxford (UK) is a translational institute that forms part of the Department of Engineering Science but is based on the Medical Sciences campus at the Churchill University Hospital. The IBME today comprises 21 tenured and tenure-track faculty, 10 support staff, and over 200 doctoral and post-doctoral researchers, working across our 6 focus areas: non-invasive therapies & drug delivery; brain engineering; biomaterials; regenerative medicine & tissue engineering; biomedical signal processing and e-health; and biomedical image analysis. The Institute consistently attracts some £10m of extramural research funding annually, and is by far the largest generator of spin-out activity within the University, having engendered 14 new companies since its creation in 2008. These include OrganOx Ltd, which has developed the world's first normothermic organ perfusion device for organ preservation and repair prior to transplantation; OxSonics Ltd, focused on ultrasound-enhanced oncological drug delivery, and OrthoSon Ltd, for minimally invasive intervertebral disc replacement. The Institute's contributions to medical technology innovation and clinical translation for societal benefit were recognized by the award of the 2015 Queen's Anniversary Prize, received during a ceremony at Buckingham Palace in 2016.

Presentation Title

Translating biomedical engineering research into technology: from organ preservation to ultrasound-enhanced drug delivery

Presentation Abstract

Complex medical devices can have a major impact on enabling and improving therapeutic interventions. However, translation of basic and applied biomedical engineering research into clinical, societal and commercial value requires a combination of rigorous pre-clinical research, reduction of technologies to their simplest form, and robust clinical trial design that will facilitate both regulatory approval and ultimate clinical adoption. This journey of biomedical engineering translation will be illustrated in the fields of organ preservation and oncological drug delivery. First, the development of

the world's first normothermic liver preservation device for improved organ preservation and repair prior to transplantation will be described, from early prototyping and large animal studies to fist-in-man and randomized clinical trials leading to regulatory approval and widespread stakeholder adoption. Secondly, current and emerging approaches for drug delivery using therapeutic ultrasound will be juxtaposed, identifying the combination of drug delivery and image-guided therapy monitoring that exhibit the greatest potential to impact the field of oncology.

PROF. SEBASTIEN OURSELIN

/// Professor of Healthcare Engineering, Imaging and Biomedical Engineering

King's College London

Seb Ourselin is Head of the School of Biomedical Engineering and Imaging Sciences, King's College London; dedicated to the development, translation and clinical application of medical imaging, computational modelling, minimally invasive interventions and surgery. He is pioneering the next generation of medical technologies by creating the MedTech Hub at St Thomas' Hospital, a critical incubator infrastructure combining industry focus with clinical and academic excellence.

He is Director of the London Institute for Healthcare Engineering and the EPSRC Image-Guided Therapies UK Network+ and has raised over £40M as Principal Investigator, including funding to create a neurosurgical navigation system, EpiNav and £10M under the Innovative Engineering for Health initiative to create the GIFT-Surg project. He is co-founder of Brainminer, an academic spin-out commercialising machine learning algorithms for brain image analysis. Their clinical decision support system for dementia diagnosis, DIADEM, is CE marked and medically approved.

Previously, he was based at UCL where he formed and led numerous activities including the UCL Institute of Healthcare Engineering, the EPSRC Centre for Doctoral Training in Medical Imaging and Wellcome EPSRC Centre for Surgical and Interventional Sciences.

He has published over 400 articles and is an associate editor for IEEE Transactions on Medical Imaging, Journal of Medical Imaging, Nature Scientific Reports, and Medical Image Analysis. He has been active in conference organisation (12 international conferences as General or Program Chair) and professional societies (APRS, MICCAI). He was elected Fellow of the MICCAI Society in 2016.

Presentation Title

The MedTech Hub @ St Thomas' Hospital: Engineering Better Health

Presentation Abstract

Research within the domain of Healthcare Engineering is transforming patient care. Advances in medical imaging, robotics, artificial intelligence (AI) and data science have led to enhanced and faster diagnosis, safer, more effective surgical procedures and improved patient recovery times. In addition to improving patient health, healthcare engineering research has the potential to reduce NHS costs and contribute to economic growth, offsetting increasing healthcare costs from other advances such as gene therapy.

Development of healthcare technologies and deployment into the NHS is a complex, multi-step pathway requiring the integration of several components (including hardware, software). Translation of these products requires multiple validation stages before the final component can be delivered for use in clinical studies (a pre-requisite for all new

technology). The regulatory pathway is complex and usually requires specialised support. In turn, few Medtech industries are willing to invest in the commercialisation of innovative technologies without clinical feasibility demonstration, leaving a “valley of death” between concept and translation.

These obstacles limit the impact of healthcare engineering research by elongating the time taken to implement medical technology into the patient care pathway. They cannot be solved by a single group of specialists, but requires multidisciplinary teams (from clinicians to academics, computer scientists, health economists etc.) across different sectors to work together. These teams are co-dependent and need to share knowledge, expertise and resources to create a concept-to-product translational platform capable of overcoming all restrictive barriers to translation.

To tackle those challenges, we propose the creation of an innovative MedTech Hub at St Thomas’ Hospital, with the London Institute for Healthcare Engineering as its core component to ensure the implementation of novel healthcare engineering research within 5 years of conception-to-product.

PROF. JOHN HUNT

/// Head of NTU Strategic Research Theme, College of Science and Technology

Nottingham Trent University

John's research has focused on developing breakthrough therapies, devices and technology to repair, replace, augment and in the future regenerate diseased, infected and damaged tissues in humans and other mammals using material interventions.

Understanding the generic science to deliver interventional medical therapies requiring the use of a material (living cells are also considered a material). These will come from an in depth generic first principles approach to understanding and directing the patient's cellular and molecular mechanisms and responses related to the clinical outcome and efficacy of medical devices, biocompatibility, inflammation and stem cell biology.

Tissue engineering processes are developed and applied, addressing the key areas of patient treatments requiring intervention and material implantation. The materials of choice being researched today also include cells and within that, expertise and intellectual property has been created relating to primary cell sourcing, controlling cell function and phenotype through defining and controlling extracellular matrix interactions, angiogenesis, inflammation, and tissue regeneration.

From a strong long lived generic research platform, specific applications and knowledge has been applied to and continue to be developed for musculoskeletal tissues specifically cartilage and bone, visceral and vascular tissues. Research has been funded by the European Commission, BBSRC, MRC and EPSRC as well as by Industry. Ph.D in 1992 and D.Sc. in 2006.

John has organised seven national and international conferences; the biggest being the European Society for Biomaterials meeting in 2014.

Presentation Title

Impacting Business by Design: Bring Ideas to Life

DR. MATTHEW LEWIS-LAKELIN

/// VP Scientific Affairs and Business Development

TrakCel Ltd.

Upon completion of a Ph.D in Respiratory Pharmacology, Matthew began working in the Pharmaceutical Industry in 2002. In 2012, Matthew was one of the founders of TrakCel. Using his knowledge in handling and distribution of ATMPs he has assisted with the development of the technology platform, writing user-stories for GMP critical functions. He provides a technical bridge between the software development side of the technology platform and the GxP application of the system. He is also a member of the company's Quality Unit to ensure that development and configuration of TrakCel's technology platform adheres to a GAMP-5 framework.

Company Profile

TrakCel specialises in providing software which facilitates the comprehensive management of advanced therapy products and their associated complex supply cycle. The platform is currently being used to manage, autologous cell therapies, matched allogeneic cell therapies, allogeneic therapies and personalised vaccines. The software platform is configured to match the advanced therapy developer's own processes to manage and document chain of custody and chain of identity information in a regulatory compliant record. The software has a scheduling function which can coordinate all constituents in the supply chain ensuring that co-dependent activities between collection centres, manufacturing centres, logistics providers and treatment centres are managed correctly.

Implementation of the software platform enables TrakCel's customers and partners to create electronic forms, labels, implement user-specific workflows and record critical data at each step of the therapy supply process, including activities at starting material collection centres which may not be collocated with the therapy's manufacturing facility. TrakCel also generates compliant electronic records which detail all the activities and chain of custody information for each patient's treatment. This electronic record can be used as an alternative to paper-based recording and documenting of a therapy's supply cycle and can be used for regulatory inspections and/or filings.

Presentation Title

Orchestrating Advanced Therapies

Presentation Abstract

Advanced therapies such as Cell and Gene Therapies are providing curative treatments, however the supply cycle of these products can be difficult to manage with complexity exacerbated if the therapy is autologous. The presentation will outline the caveats associated with advanced therapy supply and how TrakCel's software can be used to simplify the management of these comply therapies.

DR. CHE-HSIUNG LIU

/// Co-Founder and Managing Director

Welmark Biosolutions Ltd.

Che-Hsiung is a scientist and an entrepreneur, he obtained a biological sciences PhD degree from University of Warwick and formally a senior research associate in neuroscience at University of Cambridge, UK. Through his core research platform, he spun out a Cryo-EM protein structure contract research organisation (Microvillex) via Department of Biochemistry, University of Cambridge in 2016. With different culture background, international contact across different sectors, he funded Welmark Biosolutions in 2013 and aims to provide collaborative opportunities between the joint venture (JV) among the biopharma industries between Taiwan and UK.

Company Profile

Welmark Biosolutions is a biopharm project assisting company located in Cambridge, UK. We serve companies across Taiwan and the United Kingdom and we specialise in helping start up biotech, pharmaceuticals and university spin-out companies to identify suitable manufacturers, research collaborators, distributors and investors for joint venture opportunities.

Using our unique matchmaker strategy, our strength in delivering high-quality results is through careful identification of the ideal candidates to take businesses and researches to the next level. We're here to serve as your high performance business partner allowing stress-free communication by taking down the language barrier with our bi-lingual highly qualified consultants. Through our service platform, we are confident that our clients will efficiently achieve win-win collaborative deals with desired partners.

We have extensive networks of the major biotech companies and related industries from both Taiwan and UK, the projects we are currently assisting include the latest antibody drug conjugates (ADCs) of blood cancer, new drugs for osteoarthritis and Alzheimer's disease, regenerative medicine, 3D bio-printed medical devices, stem cell technology and continuous cell culture bioreactor.

Presentation Title

New Fight for Sight: 3D Print Human Cornea Providing a Clearer Future

Presentation Abstract

With up to 10 million people worldwide requiring surgery to prevent corneal blindness as well as 5 million people with total blindness due to corneal scarring, there is a significant shortage of available human corneas for transplanting.

Due to the lack of blood vessels, cornea transplant from one donor to the other bares relatively small risk of complication.

However, as the need of human cornea from deceased donor far exceeds the supply, currently, the corneas used for transplant are often artificial ones made by clear plastic or more recently from animals such as pigs.

The layered structure of the cornea makes bio-printing a feasible strategy to provide individual specificity using coordinates from the recipient's eye. Welmark Biosolutions is currently assisting one of leading tissue engineering spin-out company in the UK which used bio-ink containing stem cells to print the first ever human living cornea.

Combining its unique bio-ink materials and stem cell culture from human cornea, it is likely to be able to produce at least fifty 3D-bio-printed corneas from single human cornea stem cells, consequently, greatly overcome the supply limitation from human donors and provide a solution to combat the world-wide shortage.

We are seeking the investors and business partners from Taiwan to form a team to carry out this 3D-printed medical device development for pre-clinical trails and/or human clinical trails and eventually take this to the market.