The All Party Parliamentary Engineering Group

21 March 2017

Exciting advances in medical imaging

Chairman

Professor the Lord Broers

Speakers

- Professor Andreas Fouras, Chairman and CEO of medical technology company 4Dx
- Professor Kevin Brindle, Professor of Biomedical Magnetic Resonance in the Department of Biochemistry at the University of Cambridge
- Professor Mark Lythgoe, Founder and Director of the Centre for Advanced Biomedical Imaging (CABI) at University College London

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Introduction

Lord Broers, Chairman of the group, began by thanking everyone for attending, then introduced the three speakers.

Professor Andreas Fouras is an Adjunct Professor at Monash University in Australia, and visiting Professor at the Cleveland Clinic and Los Angeles Children's hospital, where he remains active in his research work. In 2012, he founded the life-changing medical technology company 4Dx, which aims to augment the capabilities of respiratory diagnostics currently available, leveraging information that has until now remained hidden in x-ray images.

Professor Kevin Brindle is a senior group leader in the Cancer Research UK Cambridge Institute. The current focus of his work is to develop novel imaging methods to detect cancer and disease progression, and to monitor early tumour responses to treatment. He was elected a Fellow of the Academy of Medical Sciences in 2012 and to the European Academy of Cancer Sciences in 2014. He was awarded the European Society of Molecular Imaging Award in 2013 and the Gold Medal of the World Molecular Imaging Society in 2014.

Professor Mark Lythgoe is the Founder and Director of the Centre for Advanced Biomedical Imaging (CABI) at UCL, a new multidisciplinary research centre for experimental imaging which hosts 10 state-of-the-art imaging modalities and 50 researchers. Professor Lythgoe is also Director of Biomedical Imaging Research at the Francis Crick Institute. He founded the UCL Centre for Doctoral Training in Medical Imaging, and is co-Director of the programme.

Professor Andreas Fouras

Prof Fouras began outlining his career, from his training as a mechanical engineer to his work with wind tunnels. He stated that we live in an 'engineered' age, and that engineers are the 'do-ers' that turn science into reality. He then turned to healthcare and claimed that we are losing one part of the battle. He argued that the rising costs of healthcare of unsustainable. Prof Fouras argued that medical

imaging could greatly help to reduce the cost of healthcare by freeing up Doctor's time, but also could greatly improve the accuracy of diagnosis.

Prof Fouras then described the similarity of his work with the lungs and his previous work with wind tunnels. His work with wind tunnels involved taking photos of air moving aircraft, which he then moved into human medicine – trying to find where the air is moving in someone's lungs.

Prof Fouras finished by stating that with the help of engineers, we can set a target to develop a healthcare system that is better and cheaper. He advised the students in the room to start thinking of STEM subjects as health care subjects, too.

Professor Kevin Brindle

Prof Brindle began by describing the way in which medical imaging is currently used, to develop methods to get early evidence of disease. Prof Brindle also highlighted that the issue with this conventional method is that by simply looking at tumours and their reaction to medicine, is that everyone reacts differently. Therefore, time can be wasted by waiting for the tumour to react visibly.

Prof Brindle went on to talk about MRI, which he works on, which instead of imaging can track small molecules inside tissue such as glucose. The benefit of this, Prof Brindle stated, is that tumours universally consume molecules like glucose. Therefore, Prof Brindle stated that it was possible, after taking a sample down to near absolute zero and injecting it into a patient, to measure and observe where the glucose goes in the human body and if it is consumed by a tumour.

Professor Mark Lythgoe

Prof Lythgoe began by describing his unorthodox entry into the scientific world. He described how he had no A-Levels or further education and went from working in a factory in Manchester to training dogs in Israel before finding his way into engineering and science.

He then described his current work with photo acoustic imaging. This involves using a laser to shine red light into the body, which is in turn absorbed by pigments. The pigments then heat up, expand and giving out sound. When this happens, Prof Lythgoe stated that it was possible to get a picture of all of the blood vessels of the body.

Questions and Answers

Q – Paul Jackson, Engineering UK – Do specialised engineering degrees prepare you for a career in engineering?

A – Prof Fouras – Prof Fouras argued that it is entirely worthwhile to have breadth and depth of knowledge across a range of subjects.

A – Prof Brindle – Prof Brindle highlighted his own experiences, saying that his first degree was in biochemistry. He 'drifted in' to his current work simply because he found it interesting.

A – Prof Lythgoe – Prof Lythgoe argued that everyone finds their own route. He found science and did not look back, he argued that what path you choose is what connects with you.

A – Silas Gill, Abingdon School – There is a lot of talk about MRI – is there a way to expand the use of CT scans and X-ray?

A – Prof Fouras – Prof Fouras made the point that X-ray leaves behind information. What his work does is sees how they move and provides better information for health care professionals.

Q – Yenyun Fu, London Bridge Ventures – What resolution is achievable with photo acoustic techniques?

A – Prof Lythgoe – Prof Lythgoe stated that photo acoustic techniques goes down to the millions of microns, but as you get finer in terms of resolution it gives a smaller picture. However, he highlighted that the thing that the method cannot do is project depth, which other techniques can.

Q – Helen Meese, Institution of Mechanical Engineers – What would be your ultimate achievement?

A – Prof Brindle – Prof Brindle stated that his technology was trialled on its first patient last year and if it was used by clinics it would be his greatest achievement.

A – Prof Fouras – Prof Fouras said that the real achievement is to make a difference to people's lives.

Q – Irene Serrano Gonzales, Aecom – Are we losing anything from relying on robots or machines?

A – Prof Brindle – Prof Brindle argued that in adopting this technology we can see what doctors cannot see. He stated that imaging opens windows in to the body. This assists clinicians, not replaces them.

Q – Baroness Howe – What are your recommendations for dealing with the problems of an ageing population?

A – Prof Fouras – Prof Fouras argued that lungs slow people down the most in old age.

A – Prof Brindle – Prof Brindle made the point that cancer is usually a disease related to old age. By identifying it earlier, he argued, we can hold it back for longer.

Q – Philip Carter, Boeing – It seems there are parallels between the aerospace industry – what challenges are there in terms of safety certification and your technologies?

A – Prof Brindle – Prof Brindle described that the biggest problem is with validation. There must be the ability to standardise across varying machines. He also said that the technology was very expensive at this current moment in time.

A – Prof Fouras – Prof Fouras highlighted the issue of safety in imaging, particularly in regards to radiation.

Q – Lord Patel – What is the next step when you are developing technology, when do you start thinking about patents? Do patents make technology lose its value to the public?

A – Prof Fouras – Prof Fouras made the point that often companies are not concerned with the value that a technology has to society, they are more concerned with revenue streams.

A – Prof Lythgoe – Prof Lythgoe said that it was a question of philosophy. He stated that the last lab he was involved with was open access and had a free share of information.

A – Prof Brindle – Prof Brindle disagreed with Prof Lythgoe about the benefits of open access. He stated that if you do not patent you rob the world of your invention. To take a product to clinic, he argued, it must be commercially viable.

Q – Michael Hirst, Young Engineers – Where does your funding come from, are you multinational and does it help to have people on your team from different backgrounds?

A – Prof Lythgoe – Prof Lythgoe made the point that it is difficult to get projects off the ground, and that submitting for grants is a very difficult to get going. He also stated that it was important to have a strategy between research and commercialisation.