

The All Party Parliamentary Engineering Group

The grand challenges for engineers over the next 50 years

Chairman

Professor the Lord Broers

Speakers

- Sir John Parker, President of the Royal Academy of Engineering
- Professor Robert Mair, Head of Geotechnical Engineering at Cambridge University
- Professor Sir Peter Gregson, Chief Executive and Vice-Chancellor of Cranfield University
- Dr Eleanor Stride, Fellow at Oxford University

Introduction

Lord Broers welcomed the guests and the speakers, stating one of the primary functions of this engineering group is to develop and encourage more young engineers.

The Royal Academy of Engineering listed the greatest 20th century engineering achievements as: electricity, cars, radio and television, agricultural mechanisation, air-conditioning, highways, space craft and medical advancements.

Engineers will play pivotal role in solving the grand challenges for mankind over the coming decades. The challenges faced over the coming decades include: Making solar energy more economical; developments in fusion technology (in which the UK is a global leader); carbon dioxide reductions; nitrogen cycle managements; clean water access; health; securing cyberspace; enhancing virtual reality; advance personalised learning; engineer tools for scientific discovery; and reverse engineering the human brain.

Dr Eleanor Stride (Oxford University):

Dr Stride began with stating that medical advancements are often not thought of when people consider the contributions that engineers make to society.

She explained that the fundamental problem within medical engineering is translating medical discoveries into what doctors can actually use. The nanobubble technology that she is developing will enable medicines to be transported through gaseous bubbles injected into the patient, which target specific areas of the body.

Although this is a medical issue, Dr Stride explained that through the eyes of an engineer she is solving a transport or infrastructure problem and so approached it as such.

She closed by saying that tissue engineering will be very important with our ageing population and there is a great deal of research into how can we extend life and improve its quality.

Professor Robert Mair (Cambridge University)

Professor Mair stated his chosen topic of discussion would be physical infrastructure. This is essential to the economy and productivity as it promotes mobile businesses and social wellbeing.

There are four main infrastructure sectors: transport, energy, water and waste. On all forms of transport, he said, we can expect to see massive overcrowding by 2020, which requires urgent solutions.

The UK has pledged to reduce its carbon emissions by 80% by 2050, based on 1990 levels. There are currently 10 nuclear sites in the UK contributing 15% of the UK's energy needs. By 2020, there will be 3 active sites left and by 2025 there will be just 1. The decline in nuclear power will make it far more difficult to reach the carbon target.

The average daily water consumption of a UK citizen is 150 litres. Currently the leakage rate from distribution sites in the UK is 23%, which must be dramatically improved to increase capacity and efficiency.

He highlighted the importance of adapting to climate change and investigating how vulnerable our infrastructure is. The railway link in Cornwall left swinging in the wind following floods is a prime example of this.

More than 40% of London's waterways are over 40 year old and the London Tube system is over 100 years. In the age of big data, we need to take advantage of this and build smart infrastructure that can tell us its state of repair. The current Crossrail construction project is a catalyst for all UK infrastructure projects.

Sir John Parker

The re-industrialization of Great Britain must underpin the right type of economic growth. Having visited many research facilities, Sir John is confident and pleased with the direction UK engineering is heading in.

The financial crisis defeated the idea that Britain can rely on the service sector alone. We need to go back to a different industrial cycle where we research, produce and manufacture all within the UK. Some facts to illustrate the success of British engineering: every 2.5 seconds a Rolls-Royce made engine makes an airplane take off. Within the UK every 20 seconds a car is produced.

He said that youth is vital in the industry and that great ideas and research from universities needs to be taken forward and produced for the market place.

Sir Peter Gregson

Sir Peter wants to focus on who we are as engineers rather than what or where. We must think about inspiring young engineers into studying. In the old days engineering was on a grander scale than it is today, with divisions between civil engineers, ship builders etc. and was therefore much simpler to categorise. Now there are diverging engineering sectors all of which overlap making engineering more difficult to define and categorise.

We must identify how we equip and inspire the new generation, particularly women into engineering. An example of this effort is the Rolls-Royce science prize, where young people can aspire and be part of something bigger than simply the classroom. For children and young adults a connection with a firm such as Rolls-Royce can go a long way in inspiring them to follow similar careers in that sector.

Questions and Answers

Dr Helen Meese (IMEchE) - do you agree we need a chief engineer advisor role that is constantly present within government?

Sir John responded saying he is confident in politicians and believes that they are switched on. Also we recognise that there are in fact many engineers throughout the departments within government however it would not be a bad thing to have a few more where they are needed.

Roma Agrawal (WSP) stated the challenge is gaining the talent required and educating young people for jobs that don't even exist today. What can be done to help educate youth and provide this demand for talent in the engineering sector?

Dr Stride said it is vital to establish role models and to help young people see the excitement and pleasure that creating something new can bring them and others. Overall we need to lay out to school children plainly the enjoyment of creation.

Aidan Hogg (Imperial College) - how can you better show young people the opportunities for engineering available to them?

Sir John responded commenting engineers are terrible at marketing themselves. The government has a responsibility to show families and children the importance of engineering in the world.

Penny Goodman (Forest School) commented that small businesses face great barriers to compete with larger, household name companies.

Sir John challenged the premise that the presence of big businesses in the sector is damaging to smaller businesses. He said that often small scale firms need big businesses for various parts of their supply chain and feed off them. A healthy engineering sector requires a mix of larger, established companies and smaller innovative businesses.

Ben Rowlinson (Young Engineers) commented that one of the most important challenges is the development of technology and infrastructure in the developing world.

Lord Broers cited Engineers without borders saying they are an example of this sort of work and that the government is focused on this challenge.

Joanna Chidgey (Westminster School) voiced concern that there are engineering skill shortages and these must be met sooner rather than later. We should however leave marketing of engineering to the professionals.

Sir Peter responded that messages of engineering to young people should be more consistent and focus on the big picture of engineering. Our claims and plans as engineers must be backed up by actions.

Adele O'Callaghan (Portsmouth High School) commented that the introduction of iPads and other technology into schools is vital in the educational achievements for children in this country and their ability to see how engineers affect their lives. Educational opportunities should also be made more visible such as the A-level course and GCSE.

Dr Stride commented we need to be better at merging sciences together. We don't need to establish new education qualification but look at reforming the way maths and our sciences are taught and how we can show that with all of these different areas working together engineering on any level can take place.

Laurence Moran (Atkins) - can we make the right infrastructure progress whilst being environmentally friendly?

Prof Mair said that fracking is important in this debate and he has authored the Government's report into the safety of fracking. It should be clear that we should not advance engineering projects or technological development that harm the environment.

Lord Chidgey - is it time to subsidise engineering in university?

Sir John cited £500 million MSC budget. Ease the skill shortage and financial pressure. There is a deficit of young people that can fill the gap left from older engineers retiring. It should be noted that

it is difficult for these universities that put on courses such as engineering as they are expensive and require facilities unlike other degrees in the mainstream university.

Edward Keys (Westminster School) asked should there be more opportunities for young people through engineering internships?

Sir John responded saying that the large engineering companies do provide adequate internship schemes. They are always flooded with applications and so you need to get them in early.

Chloe Cook-Richardson (Portsmouth High School) - how can we make this easier and utilize the power of the media to encourage people into engineering.

Dr Stride commented the power of media is huge and we need to enhance this into a platform that offers educational opportunities rather than advertises celebrity news.

Vote of thanks

Lord Broers thanked the speakers for the discussion and the following question and answer session.

He then thanks the guests for their attendance and challenging questions.