

GLOBAL CHALLENGES – SOLUTIONS FROM SCIENCE

Parliamentary Links Day is the largest scientific event held annually at the Houses of Parliament. Organised by the Royal Society of Chemistry, it also involves the active participation of sister societies including the Society of Biology, Royal Academy of Engineering, Geological Society, Institute of Physics, the Royal Society, the Campaign for Science and Engineering, the Royal Astronomical Society, the Council for Mathematical Sciences, and many other scientific organisations. This year's Links Day coincided with the United Nations designated International Year of Chemistry 2011 (TYC 2011) which was launched at the House in January this year and the audience was present by invitation of Andrew Miller MP, Mark Lancaster TD MP and Dr Julian Huppert MP, who jointly chaired the event.

Following a welcome from the Rt Hon John Bercow MP, Speaker of the House of Commons, the programme of addresses and scientific presentations was introduced by **Professor David Phillips OBE FRSC, President Royal Society of Chemistry**: This year we celebrate the 100th anniversary of Marie Curie's second Nobel Prize, in this case for Chemistry in 1911, for the discovery of radium and polonium, and the isolation and study of radium's remarkable properties. Her radiochemical research also led her to improve humankind's life through use of portable radiography units that emanated X-rays to examine for shrapnel and broken bones in World War I. We also celebrate Dorothy Hodgkin, the only British female Nobel Laureate. However, many more women are needed in Science. It is very important to inspire young people sufficiently to encourage them to study chemistry using opportunities such as the water test, for example.

Summaries of the presentations follow.

Professor Lorna Casselton FRS, Foreign Secretary and Vice President of the Royal Society

The Royal Society post of Foreign Secretary was established in 1728 before the government had one. The need and importance was emphasised, for more practical skills to be introduced, especially into universities in Africa, in order to help address their current social and economic requirements by using better technology at the operational level. Policy makers and scientists are also being brought together for discussions under the banner on "People and the Planet".

Dr Shaun Fitzgerald, The Royal Academy of Engineering

Work at the Royal Academy of Engineering has focused on the challenge of energy supply. Fossil fuels are here to stay but their usage will increase. We need to re-consider the manner in which 40% of the energy supply is currently consumed in buildings. Well-insulated buildings with self-ventilation using fresh air would help reduce energy demand.

Dr Mark Downs, Chief Executive of the Society of Biology

Biology plays a critical role in many areas required to meet global challenges. These include Climate Change, Food security, International Trade agreements, Border Security, Criminal Justice, Forensic Science, Diabetes and Diet. Education and training are also very important aspects of the work of the Society.

Dr Bryan Lovell OBE, President of the Geological Society

Climate change is a defining issue of our time, the full understanding of which requires the long perspective offered by geology. Earth scientists can read in detail the geological record of changes in climate that occurred long before we were around to light so much as a camp fire, let alone burn coal, gas and oil. A dramatic global warming event that took place 55 million years ago gives us a particularly clear indication of what happens when there is a sudden release of a billion or more tonnes of carbon into Earth's atmosphere. It gets hot, the seas become more acid and less oxygenated, and there is extinction of life to such an extent that new boundaries are established in

the geological record. We are at least a quarter of the way to repeating that ancient natural input of carbon at 55 Ma through our own agency, prospectively establishing a new geological epoch – the Anthropocene. Still worse, we are dumping carbon even more rapidly than happened at 55 million years ago. The increasingly clear message from the rocks to us all is that it would be a good idea to stop pulling that carbon trigger. The message from the rocks to the oil and coal industries is that they are particularly challenged by carbon. The oil industry can respond by playing a key role during the transition to a low-carbon economy, storing carbon safely underground once we've had the use of it. That role can only be played within a regulatory framework that establishes a fungible price for carbon. National leaders can now be convinced of the need for action by the geological evidence: you can't argue with a rock.

Iwan Roberts, Ashok Kumar Fellow, Institution of Chemical Engineers

Ashok Kumar, both an MP and a chemical engineer, who died suddenly, is remembered in

this Fellowship. How does chemical engineering work? The proactive way involves production of data leading to development of new technologies and ultimately new products. The reactive way is exemplified by the releases of contaminated red mud in Hungary which required help from the UK involving Sir John Beddington and Philip Greenish of the RAE. Chemical engineering is on the skills shortage list and graduates are encouraged to work in this area.

Chi Onwurah MP, Shadow Minister for Innovation and Science

In order to help resolve global challenges, the best way is to go to Parliament. Science and politics need to work well together. Newcastle punches above its weight with an outstanding range of scientific activities. These advantages would be challenged by cuts to research. A less prosperous future is threatening hence the need for a public-private partnership. There is a three year funding plan in UK, but a more strategic 10 year plan in China. The Haldane Principle creates the right environment for innovation. Fundamental research is important and Science, Engineering and Business must all be linked together. Direct Government funding for research is required, and there is a need to place science at the heart of the economy and culture.

Andrew Miller MP, Chair of the Commons Science & Technology Committee

Following the General Election, the reformed S&T Select Committee have tackled a broad range of STEM-related topics. Seven reports have been published and more are on the way. The work commenced with an investigation and evaluation of criticisms made of the professional integrity of scientists at the University of East Anglia affected by the hacking of emails related to climate change. This

was followed by an assessment of the UK's need for Technology Innovation Centres (TICs) as a national facility essential for promoting industrial and economic regeneration. A review of science advice available to Government in emergencies considered swine flu, cybercrime, solar storms and volcanic eruptions, followed by a review of particle physics and astronomy. The supply of strategic metals, as the title suggests, is very important to industry. The reasons for and likely impacts of a move by the MRC (Mill Hill) to a UCL site at St Pancras to create the UKCMRI, were examined. The Forensic Science Service, Peer Review of Scientific Publications and the urgent need for more Practical Hands-On Science and Fieldwork in Schools complete the current picture.

Rt Hon David Willetts MP, Minister of State for Universities and Science

A message from the Prime Minister was presented in which he expressed his regret that he was unable to attend this important event. He congratulated the Royal Society of Chemistry on the relevance of the themes presented and their timing, with their emphasis on climate change, food and water security, science policy, and the urgent need for the training of a new generation of scientists, and the vitally important maintenance and development of bridges between Parliament, Government and Science. Evidence was provided to Treasury in support of the £4.6B ring-fenced expenditure budget, plus an extra £100m capital. Other matters have been supported including the legal rights of scientists when presenting scientific data for public scrutiny.

Visits have been made to all BRIC Countries who have expressed their respect for British science which appears to be highly regarded worldwide,

especially in universities. They are seeking opportunities for collaboration and practical ways to strengthen their ties through such organisations as the British Chamber of Commerce and the publication of jointly authored articles in high profile scientific journals. This is especially noted in Brazil, for example, where the UK science has a very high impact. Many countries are still not yet familiar with the Haldane Principle and its implications for politicians responsible for science budgets. Some countries are unaware that UK politicians, even Ministers of State, are therefore not expected to assume responsibility for signing binding agreements on international collaborative scientific research and have only a limited role in directing and agreeing to such objectives made on behalf of scientists. Indeed that is one of the reasons why UK science, managed by peer review, is held in such high regard internationally. Challenges emerging from China involve the clear recognition by them that ocean acidification arising from coal burning, especially in China, results in a significant impact on oceanic chemistry. Does this require a response from the UK? The good news however is the realisation that understanding and cooperation must be undertaken among and between scientists and not at the political level.

Professor David Cope, Director of the Parliamentary Office of Science and Technology

The recent loss of both Ashok Kumar and Lord Flowers is deeply regretted. POST emphasises the importance to the UK as a whole, and especially to Scotland and Northern Ireland, not just London and the South East. POST is also continuing to extend its influence worldwide, initially in North America, Japan, Chile and also to Africa.

Mr Jonathan Flint, Institute of Physics Council, Chief Executive Oxford Instruments plc,

Investment in science can pay dividends right now, as well as driving long term prosperity. That was the key message given by Jonathan Flint, Chief Executive of Oxford Instruments, and a Council Member of the Institute of Physics. His position as Chief Executive of a publicly listed company and as a council member allows him to straddle the commercial and scientific worlds. It gives a perspective on the difficult path between the spark of a new idea, and seeing the effects of that idea in society at large. Today's global challenges cannot be addressed without a partnership between the commercial and the academic sectors. Businesses form the bridge between science and the consumer. Science is capable of coming up with the solutions to many of society's problems and companies like Oxford Instruments will turn that smart science into commercially successful products. Mr Flint identified examples where his company's advanced technology is contributing to future energy options, from fusion power to low energy lighting, and testing for hazardous materials in the environment. His key message was that investment in science is delivering real economic benefits, today, through the manufacture of the high technology equipment involved. Supplying high performance equipment gives real revenues, real jobs, today, but more should be done to educate people about the power of science and its importance to the world, for the future, and for today.

Dr Jim Wild, The Royal Astronomical Society

As our society and economy grows increasingly dependent on hardware in space, in the air and on the ground, the influence of solar activity on human technology is becoming more and more important. So-called



“space weather” is now included in the UK’s National Security Strategy and is being studied for inclusion in the Government’s National Risk Register. In order to understand the risks posed by space weather, and ultimately to predict and mitigate against the consequences, the physics of the electromagnetic Sun-Earth connection (initially investigated in the context of natural phenomena such as the magnificent aurora borealis) is now being studied to understand how solar flares and coronal mass ejections can impact upon electricity supply grids, radio communications, aviation safety

and satellite operations.

Dr Hilary Weller, Council for the Mathematical Sciences, University of Reading

The UK Met Office weather and climate forecasting models have proved some of the most accurate in the world. However, supercomputers are becoming larger with less power per processing core and the Met Office models are not performing well on these new computers while other forecasting centres are forging ahead. Forecast speed is often limited by the speed at which different processors on a computer can communicate and

so if a model relies on lots of communication it will grind to a halt. The Met Office model divides the planet into latitude-longitude grid boxes which get very narrow near the poles leading to an excessive amount of communication. In order for the Met Office to remain competitive, they must move away from a latitude-longitude grid to something more like a football, made of hexagons and pentagons. The Gung-Ho project, joint between Natural Environment Research Council funded academics, the Met Office and the Science and Technology Facilities Council, is

carefully scoping the design for a new forecast model which will ensure that the UK remains at the forefront of weather and climate forecasting. This careful design phase is envied worldwide. Conversely, forecasting centres sometimes invest heavily in an untested, flawed strategy as they do not have the time or resources for such careful design.

Presentations were also made by Dr Mike Pitts, The Royal Society of Chemistry, and Imran Khan, Director of the Campaign for Science and Engineering.

