ROYAL SOCIETY YEAR OF SCIENCE AND INDUSTRY

Dr Simon Campbell CBE FRS
Royal Society

In the 1660's Robert Boyle, one of the founders of the Royal Society, wrote a scientific wish list. He dreamed, among other things, of flying machines, GPS and commercial agriculture. Now we all know these changed our lives for the better, and subsequently achieved major commercial success. Later the Industrial Revolution brought scientists, engineers, technologists and entrepreneurs together to apply science to industry and the economy. Some outstanding outcomes include the steam engine providing power, chemistry and geology improving ceramics and the use of natural resources, mechanics and engineering constructing machines for transport and manufacture. Since the Enlightenment, innovative science has continued to be the bedrock for industry to translate into new products with both commercial and social benefits.

The situation in today's harsh economic climate is no different, as there is a general recognition that world class science and engineering are essential for revitalising our economy and generating long term growth, but funding must be internationally competitive.

Drawing on the advice of the science community, the Government has set out eight future technologies in which it believes the UK has the potential to be world-leading, and which will bring economic growth. Announced by the Chancellor at the Royal Society in November 2012, they include the 'Big Data' revolution and innovations in energy efficient computing; synthetic biology; regenerative medicine; agri-science; energy storage; advanced materials; robotics and autonomous systems; and satellites and commercial applications of space.

The Royal Society is committed to innovative science, and is supporting the Chancellor's challenge to the scientific community for Britain to lead the world in these areas. It recognises that world class research and development in UK industry is essential for transforming innovative ideas into commercially successful products, economic growth and securing the science base. Via its science and industry programme and other initiatives, the Society aims to understand and respond to the needs of industry. It is focused on engaging with the industrial sector to develop arguments that higher investment in the UK science base is essential for international competitiveness.

. . . new products with social benefits . . .

The Royal Society is highlighting innovation through a Year of Science and Industry. Launched at the Society's 'Labs to Riches' event at the end of 2012, this brings together industry, academia and the public across a range of events. These include scientific meetings, prize lectures, workshops and industrial symposia – all of which are contributing to a better understanding of industrial research and development and a greater appreciation for the quantity and quality of innovative scientific research

. . . impact in translational biomedicine can be maximised . . .

taking place throughout the UK.

In February 2013 a Royal Society Theo Murphy International Meeting examined the computational methods developed for the storage and indexing of massive data, and a further meeting was held in London focused on 'Taking x-ray phase contrast imaging into mainstream applications'. In the coming months there will be meetings on cell polarity research and how its impact in translational biomedicine can be maximised; Moore's Law and how microelectronics will deliver new and non-electronic functionality for optical, chemical and biological systems; sustainable computing; regenerative medicine; and drug discovery, regulation and the law. In addition the Royal Society will be holding a symposium with key industry representatives which will investigate the major issues facing them today and over the coming years and identify common themes for effective translation in the various sectors.

These have expanded the Society's calendar, which already includes initiatives in scientific excellence such as the Royal Society Industry Fellowship scheme and the Brian Mercer Awards for Innovation and Feasibility. Information on events as part of the Year of Science and Industry can be found at royalsociety.org/events/2013/year-science-industry/

Sometimes a distinction is drawn between basic or discovery science and applied science, as though they exist as separate endeavours. In practice, research is a continuum from discovery science through translation to subsequent exploitation. Paul Nurse, the President of the Royal Society, characterises this as an interactive ecosystem, with knowledge generated at different places within a continuum influencing both upstream in the creation of discoveries, and downstream in the production of new applications. He cites the case of the steam engine which influenced the formulation of thermodynamics. George Porter, a former President, once referred to there being two types of science "applied and not yet applied".

. . . influenced the formulation of thermodynamics . . .

There can be cultural differences between academia and industry which is an important area we will explore with our Year of Science and Industry. The key elements are people and their ideas. We have to ensure that where there are barriers to permeability between sectors, we can break them down. A company will need designers, production line workers, accountants and the innovation ecosystem needs a variety of skills found in different places. We need scientists to mix with the best minds from industry, the City, the public services, the media, to spark off new ideas so that research can benefit us all.

The ecosystem will only flourish with proper financial investment. Last year the Chancellor told an audience at the Royal Society 'We have great science in Britain. We are backing it. And we will do more.' Indeed, the Government has found funding to support the UK's research even during budget constraints. It clearly understands that ideas, innovation and commercialisation drive future prosperity. However, while this investment is essential and appreciated, it allows UK research no more than to stand still. The UK produces the most academic papers per financial unit spent in the G8, but other nations set investing in research at a higher priority. China, India, South Korea and Taiwan are all more ambitious. Germany has committed an extra €12bn to education and research, with a view to driving national prosperity. Finland and Sweden are pumping money into research, spending nearly 4% of GDP on R&D. By contrast, the UK trails the big spenders, with the public and private sectors combined investing only 1.79% of gross domestic product in research in 2010. Economies across the world are putting their weight behind science, while UK investment is lagging.

When we talk about the relationship between science and industry we have to look at business spend on R&D, an essential part of national investment. In Japan and South Korea this is over 70% of R&D spend. *Where* businesses spend their resources is increasingly competitive. The UK has nurtured world renowned pharmaceutical and automotive companies, and design pioneers and cutting edge new technology, but industry spends less on R&D in the UK than our competitors.

The Royal Society's Year of Science and Industry will identify and help overcome barriers between our world class science base and industry. We are aware of the challenges that face the UK's economy, but our activities can leverage a cultural shift that will increase the flow of ideas and investment between academia and industry and rekindle the entrepreneurial spirit of the enlightenment and the industrial revolution. The UK remains a genuine world leader in research – we now need to ensure that we translate new discoveries into an innovation-based and sustainable economic recovery.