The Richard Dimbleby Lecture 2012

The new enlightenment

Sir Paul Nurse PRS

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EXCELLENCE IN SCIENCE

THE ROYAL SOCIETY

The Richard Dimbleby Lecture 2012 was given by Sir Paul Nurse, President of the Royal Society on Tuesday 28 February and was broadcast on BBC1 that evening.

2012 is the 40th anniversary of the Richard Dimbleby Lecture, which is given in memory of the television broadcaster Richard Dimbleby, father of broadcasters David and Jonathan. Lord Annan was the first lecturer in 1972.

Cover image: Illustration of blue mould as viewed through a microscope. Figure 1 of Schem. XII from *Micrographia: or some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon*, by Robert Hooke, 1665.

The new enlightenment

The Dimbleby family, ladies and gentlemen, this evening I am going to talk about my passion for science. I have very personal reasons for doing so. Recently science saved my life. Let me explain. Just before Christmas I was planning a trip to the Antarctic research station at Scott Base on the 100th Anniversary of Captain Scott's expedition to the South Pole. I have wanted to visit the Antarctic for years, and before going I went for a routine medical check-up. But the medical turned out to be far from routine.

I was diagnosed with serious heart disease, and in January I had a quadruple heart bypass. The South Pole had to wait, but thanks to the skill of my NHS doctors, some of whom, I am delighted to say, are in the audience, and to the science which underpinned my treatment, I am still alive and able to be here tonight.

I am also passionate about science because I have been a researcher for over 40 years, and want to share with you the wonder of science, what it is like to be a scientist, how it enhances our culture and our civilization.

Science can improve our health and quality of life, help solve the world's biggest problems, and support sustainability. It influences nearly everything we do, from heating our homes, turning on the radio, using our phone, browsing the internet, the food we eat, the pill we take for our headache.

And science is absolutely essential to drive our economy. Science matters to us all.

Science not only enriches our minds, but can also provide a trusted guide to tackle global problems that face us right now, such as feeding the world, ensuring we have sufficient energy, keeping an ageing population healthy.

I also believe that science can play an even greater role in improving our economy, in protecting our jobs and incomes. I want to remind you of a time when science helped make Britain an economic powerhouse during the Enlightenment and Industrial Revolution, and to explore how we can make science work to better drive our economy today.

But first my own passion for science. It began when I was a nine year old boy. It was 1958, the beginning of the space age. I was looking up at the London night sky and saw amongst the stars, one that was rapidly moving and was very bright. This was Sputnik 2, the second man made satellite to orbit the earth, and inside was a dog called Laika. I must admit I felt sorry for Laika because I had a dog of my own.

Watching this man-made star moving and twinkling in the night sky made me think about the other stars, so I went to my local public library and discovered that stars were suns, that there were galaxies up there too, and some of the stars were planets. I pestered my parents for a small telescope, and found I could see the crescent of Venus, the moons of Jupiter, the rings of Saturn, the craters of the moon.

Go out early tomorrow evening and you will see Venus and Jupiter to the west, and Saturn to the south. Use a telescope if you can. Seeing such marvels for yourself is much more immediate and personal than looking at images on the television. The natural world is fascinating, and is even more so if you are prepared to observe, to experiment, to think, and to try and understand. That is what scientists do, and there is a little bit of the scientist in all of us, especially when we are children.

I am passionate about doing science and completely agree with Sir Humphrey Davy, the 19th century chemist and inventor of the miners' safety lamp, when he said, "To me there never has been a higher source of honour or distinction than that connected with the advances in science"

That is why I still run a lab – it's what keeps me sane. Although I am not sure my lab colleagues, some of whom are here tonight, would agree on the last point.

So, what is special about science that means we should trust it? What makes it so good at generating reliable knowledge about the natural world.

Scientists work in a variety of ways that are not unique to science. For example, they need the historian's eye for detail, the mathematician's feel for logic, the philosopher's desire to keep asking questions – and some would say the patience of a saint. When the various ways scientists work are combined together, they produce a process that is a very powerful way of creating knowledge.

The bedrock from which all science flows is reproducible observation and experiment. This means that ultimately what is observed – the data – trumps all, even the most beautiful idea. Scientists need to take account of all observations and experiments, and not just cherry pick data that happen to support their own ideas and theories. Scientific issues are settled by the overall strength of evidence.

Often a particular idea drives what observations a scientist makes, but sometimes, scientists make observations without a precise idea – or hypothesis – in mind. More whimsically I call this "following where nature leads you". An example of this from my own research, back in the 1970s, was when I was investigating what controls the division of cells, a problem of great importance for the growth and reproduction of all life, and for understanding cancer.

I was searching for genes needed for cell division, by looking for yeast mutants which could not divide. Such mutant cells get bigger and can be easily spotted under the microscope. I had been searching for these large sized cells for months when I spotted something quite different, a clump of cells doing the opposite, dividing at a small size.

I was not looking for such cells, it was just that nature presented them to me. But as soon as I saw them I realized they meant something important. I dragged everyone in the lab, and a few passers-by, to take a look. I was very excited, and I am sure some people thought I had gone a little mad. This clump of cells had a mutated gene which made the cells divide faster than normal, so they did not have enough time to grow to their proper size.

I discovered these small cells in Edinburgh, so I called the new gene the "wee" gene. It works like the accelerator in a car. An accelerator determines how fast a car goes, and "wee" genes determine how fast a cell divides. That accidental and simple observation set the direction for my future work. Eventually this led to the discovery that wee genes also control cell division in all of us, establishing that there is a universal mechanism controlling cell division in nearly all life. It formed the basis for my Nobel Prize and emphasises the role serendipity can play in scientific discovery.

But observations alone are not enough. It is the ability to prove that something is not true which is at the centre of science. This distinguishes

it from beliefs based on religion and ideology, which place much more emphasis on faith, tradition, and opinion. As a scientist I have to come up with ideas that can be tested. Then I think of experiments to test the idea further. If the result of the experiment does not support the idea then I reject it, or modify it, and test it again. If the results of the experiments always support the idea, then it becomes more acceptable as an explanation of the natural phenomenon.

A great recent example of the importance of testing is the experiment at CERN which suggested that sub-atomic particles – neutrinos - were travelling faster than the speed of light. If this turned out to be true then Einstein's theory of special relativity would need to be revised.

As you can imagine, the scientific community was amazed and sceptical but they did not shout the CERN scientists down. Instead they encouraged them to do more experiments to further test their hypothesis. I've been relying on my physicist daughter Emily who works at CERN and University College London, to keep me updated. The latest is, there might be either a loose connector or a faulty clock, so Einstein can probably relax – at least for the moment.

Implicit in this approach is that scientific knowledge evolves. Early on in a scientific study knowledge is often tentative, and it is only after repeated testing that it becomes increasingly secure. It is this process that makes science reliable, but it takes time. This can lead to problems when scientists are called upon to give advice on issues when the science is not yet complete. We see this every day in the newspapers – whether breast implants are safe or what foods are good or bad. The public want clear and simple answers but sometimes that is not possible.

People need to understand this and we should start in our schools. Science is taught based on the great ideas that have successfully undergone much testing, such as those of Newton, Darwin and Einstein, and so we tend to think all science is equally secure, as if written in stone. But that may not be the case, particularly at an early stage in research when knowledge is more tentative. This view of science should receive greater emphasis at school, because the public would be better able to appreciate how science impacts on society.

It is impossible to achieve complete certainty on many complex scientific problems, yet sometimes we still need to take action. The sensible course is to turn to the expert scientists for their consensus view. When doctors found I had blockages in the arteries around my heart I asked them for their expert view as to what I should do. They recommended a bypass, I took their consensus advice, and here I am. That is how science works.

This process provides a strong corrective force in the development of scientific knowledge. Look at the debate about climate change. The majority of expert climate scientists have reached the consensus view that human activity has resulted in global warming, although there is debate about how much the temperature will rise in the future. Others argues that warming is not taking place at all or that it will happen in a catastrophic way, but they have failed to persuade the majority of climate experts, who have judged the scientific arguments made to support these more extreme views as being too weak to be convincing.

There are also personal qualities which are important for science, including a sceptical attitude, honesty and transparency, courtesy in scientific dispute. Humility and self-doubt help as well, as the seventeenth century philosopher of science Francis Bacon said, "If a man will begin with certainties, he shall end in doubts' but if he will be content to begin with doubts, he shall end in certainties."

Put all this together and you have a process which can offer extraordinary insights into the natural world. These range from the profound to the quirky. I really liked a recent amusing example which reconstructed the song of a cricket that lived 165 million years ago.

But the work of science can also require courage, as it sometimes strikes at the heart of accepted thinking. Challenging established opinion is part of science, and can bring about revolutionary changes, which can be very unsettling. Displacing the earth from the centre of the universe, first to an orbit around the sun then to the arm of a galaxy within an infinity of galaxies, has had a profound effect on the position of human kind. Evolution had the same dramatic impact, moving us from being specially created and separate from the rest of life, to being related to every living organism on the planet.

Charles Darwin recognized this in his *Descent of Man*, "Man with all his qualities, with sympathy… with benevolence ... with his god-like intellect... with all these exalted powers – man still bears in his bodily frame the indelible stamp of his lowly origin"

These ideas about the earth and human kind were once unthinkable and heretical, but are now fully accepted by all those who respect knowledge and the power of reason.

Science continues to be revolutionary and we always have to be ready for what it might reveal.

Improved knowledge of human embryology and an increased ability to keep the unborn child alive, have major implications for when life begins and ends, and so for interventions, such as, abortion. Studies of the brain will reveal correlations between brain activity and what we are thinking, our memories and our emotional states. Increasingly, we are likely to be able to use chemicals to alter brain function and to modify behaviours.

Advances will have consequences for our views on free-will, justice and diversity. How much choice do we really have when we make decisions? Is punishment for certain criminal behaviours right if they are strongly influenced by an individual's genes? Will work in neuroscience influence how we educate our children? What will we learn about genetic differences between individuals, genders, and populations, and how might that influence our ideas of equality?

These are issues of crucial significance, but can only be properly addressed if we enjoy a healthy relationship between science and society. Scientists need to identify issues early, and to encourage open debate about the implications and consequences of scientific and technological advances. Such debates will sometimes be difficult, but they must take place. This is essential if we are to have a society that is comfortable with science and that can reap the benefits it can bring.

And science can bring us great practical, everyday benefits. It has always been a useful art, generating knowledge that when properly used leads to applications through technologies and engineering for the public good. At the birth of modern science Francis Bacon argued that scientific knowledge

gives us the power to relieve man's estate. Robert Hooke of the Royal Society emphasized how scientific discoveries, "on motion, light, gravity, magnetism and the heavens would improve 'shipping, watches, optics, and engines for trade and carriage."

Today the world faces major problems. Some uppermost in my mind are food security, climate change, global health and making economies sustainable, all of which need science. It is critical for our democracy to have mature discussions about these issues. But these debates are sometimes threatened by a misinformed sense of balance and inappropriate headlines in the media, which can give credence to views not supported by the science, and by those who distort the science with ideology, politics, and religion.

From the very beginning of science there have always been such threats. When Galileo argued that the earth orbited the sun, the Inquisition did not argue back with science, they simply showed him the instruments of torture. It is very important that we keep such influences separate from scientific debate. The time for politics is after the science not before.

Let's look at food security, ensuring that the world is properly fed. This has already been greatly helped by science. The Green Revolution increased agricultural production in the 1960s through high yielding cereals, better irrigation, and the use of artificial fertilizers and pesticides, developments led by the scientist Norman Borlaug. The Green Revolution is often credited with saving the lives of over a billion people worldwide from starvation. However, some environmentalists did not support these initiatives, leading Borlaug to respond, "Some of the environmental lobbyists of the Western nations are the salt of the earth, but many of them are elitists. They've never experienced the physical sensation of hunger. They do their lobbying from comfortable office suites in Washington or Brussels. If they lived just one month amid the misery of the developing world, as I have for fifty years, they'd be crying out for tractors and fertilizer and irrigation canals and be outraged that fashionable elitists back home were trying to deny them these things."

Science is once again required to improve yields, to make agriculture more sustainable, and to extend the range of crops to ecologically more marginal land. This can be helped through improving the growth of crops, assisting

plant breeding, and by the genetic modification of plants, to generate crops of high productivity, and to reduce pesticide use better protecting the environment and biodiversity.

It is time to reopen the debate about GM crops in the UK but this time based on scientific facts and analysis. We need to consider what the science has to say about risks and benefits, uncoloured by commercial interests and ideological opinion. It is not acceptable if we deny the world's poorest access to ways that could help their food security, if that denial is based on fashion and ill-informed opinion rather than good science.

Another great challenge for the world is climate change. Discussions in this area impinge on politics, commercial interests and strongly held opinions, and these influences have distorted the scientific debate. Solutions needed to counter global warming are likely to require more concerted world action, regulating the activities of the individual, of industry, and of the nation state, and such restrictions are an anathema to some with particular political and economic viewpoints. Equally those of an opposite viewpoint may exaggerate the extent of future global warming because of their affinities towards greater regulation and world government.

This leads some polemicists to confuse the debate by mixing up the science with politics. The answer here is to focus on transparency and good science. There is no room for preconceived ideas – first we need the science then the politics.

Science will also be required to develop new ways of producing energy that are environmentally less damaging. Renewables like wind, wave, tidal and solar should be evaluated, putting vested interests aside, to determine what is effective. The same applies to nuclear power where science is needed to properly assess the risks and benefits. It is not sensible to respond in a knee-jerk way without evaluation of data concerning real environmental damage and health risks, as against perceived damage and risks.

Improved scientific knowledge has brought remarkable improvements in life expectancy. One hundred years ago average life expectancy in the UK was about 50 years and now it is around 80 years. Science will continue to be needed to improve the world's health in the future.

Human genetics will identify genes which pre-dispose us to different diseases, allowing us to understand how genes influence disease, and how they interact with lifestyle and diet, promoting new ways to treat and prevent disease. There is great promise for stem cells, which can generate a range of tissues in the body, potentially repairing muscle and nerve tissue damage, countering the effects of degenerative disease and of old age.

But here too there are threats. When I worked in the United States I received regular hate mail from those who objected to stem cell research based on their religious beliefs. There are also those who challenge good science with minority opinions based on weak science, as was the case with campaigners who objected to the triple MMR vaccine. As a consequence reduction in vaccination led to children's lives being put in danger.

I have no doubt that science will continue to have a major impact on all such global issues over the coming decades.

But now I want to turn to the issue preoccupying many of us today – the economy. Science is key to creating jobs and putting money in our pockets. The Industrial Revolution brought scientists, engineers, technologists and entrepreneurs together to apply science to industry and the economy. The result was 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.

This era is symbolized by the Lunar Society, a group including James Watt, Erasmus Darwin, Matthew Boulton and Josiah Wedgewood, who discussed science and how science leads to new technologies and inventions supporting the economy. They met together in the Midlands once a month under the full moon, to illuminate them during their ride home after dinner, and perhaps after some wine too.

Where would our economy be without electricity and electromagnetism, electronics, synthetic chemistry, atomic physics, biochemistry and molecular biology? Some say, Michael Faraday answered the prime minister of his day, when asked what good his inventions of the electric transformer, generator and motor might be, by saying, "Why prime minister someday you can tax it".

Although almost certainly never said by Faraday, this anecdote captures the view of some politicians and business leaders who fail to grasp how science can enhance industrial capabilities and create wealth.

However, Faraday did eventually end up on the back of the twenty pound note. And for that matter entrepreneur Boulton and scientist Watt, architects of the steam engine, appeared last year on the fifty pound note. So science seems to be going up in value.

So, how can we make sure that science thrives in the UK and continues to bring benefits to our economy? I strongly argue that the first requirement is to have a high quality science base. We are very good at science here and have been for centuries. Britain played a major role in founding modern science and its application for the public good, through the efforts of the Royal Society in the seventeenth century, and the Industrial Revolution in the eighteenth and nineteenth centuries.

Today the UK is second only to the USA in contributions to the world's science, and is probably first in terms of cost efficiency. This is an amazing achievement for our country. There is also an increasing respect for technology and engineering in the UK, as seen with the recent founding of the one million pound Queen Elizabeth Prize for Engineering, sponsored by the Government and the Royal Academy of Engineering. We do not need to create world class science in our country, that we already have. Our task is to maintain, cherish and encourage our scientific endeavour, and to promote its use for the public good.

This is an issue that can no longer be ignored. Science is one of Britain's greatest resources. In the future we will not be able to compete on the world stage with low labour costs or by exploiting vast reserves of mineral resources. We will have to compete with our brains and with our science.

Many features important for good science are well embedded in the UK. We have a tradition of respect for empiricism, emphasising reliable observation and experiment. Most importantly, science in the UK is carried out in a culture of openness and freedom. This should never be underestimated. The scientific endeavour is at its most successful when there is freedom of thought. Scientists need to be able to freely express doubts,

to be sceptical about established orthodoxy, and must not be too strongly directed from the top, which stifles creativity.

These features are characteristic of British science but this is not the case throughout the world, even amongst some countries heavily investing in science. In more closed societies it may be possible to pursue a directed programme when the underpinning science is already clear, like building a nuclear weapon for example, but making scientific discoveries and using science in innovative ways is very difficult if the society is not free.

During the Cold War, Russia was able to build a nuclear bomb and send the first man into space, two achievements based on previously known physics. But work on genetics and crop improvement were completely destroyed, because, for ideological reasons, Stalin backed the charlatan Lysenko who rejected Mendelian genetics, widely accepted everywhere else in the world. Similarly in Nazi Germany, Hitler rejected the work of Einstein because it was "Jewish Physics." In the UK we have the freedom to do science well and we need to keep it that way.

We have to keep our spirit of adventure in science, to take risks and be prepared sometimes to fail, as research at the cutting edge is not always successful. That is a lesson that UK industry might take from scientists. When I ran Rockefeller University in New York I saw how American entrepreneurs were prepared to be bold to take risks to bring science to the marketplace. We need more of that here in the UK.

For science to flourish a broad portfolio of research investment is required. There is a continuum of research, ranging from discovery science, through research aimed at translating knowledge for application, onto subsequent innovation leading to the development of new technologies. The temptation to invest too heavily in a particular part of this spectrum should be resisted. Sometimes it is argued that we should concentrate only on translation and innovation and not discovery, but that is a mistake. As Sir George Porter, Nobel Laureate and a previous President of the Royal Society said, "To feed applied science by starving basic science is like economizing on the foundations of a building so that it may be built higher. It is only a matter of time before the whole edifice crumbles".

Research often needs a longer time scale than is usual with the more short-term priorities of private business, or for that matter of politicians elected on a 5 year cycle. This causes problems with longer-term projects, such as translating scientific advances into useful applications.

We have a real opportunity in the UK of improving the translation of biomedical science into better treatments through an innovative partnership between researchers, the NHS and industry, promoted by the Academy of Medical Sciences. The UK has a great advantage with a very strong life sciences research base, a unified health service, and an active pharmaceutical industry. If all three work together we can carry out research which will not only bring better health services but also help our economy.

Because the NHS belongs to the people, it is my view that NHS patients will be open to participating in research which will bring better health services to the nation and also help our economy. This certainly applies to me. The NHS helped me and I feel a responsibility to assist in clinical trials, allowing what could be learned from me to improve treatment of future generations. It is time to use science to turn the NHS into a healthcare producer as well as a healthcare provider.

Bridging the often short-term pressures from commerce and politicians with the longer times required to develop discovery research into effective applications, is crucial. Greater collaboration between publically funded research and private companies, can help move science to application.

The UK is good at science but we cannot rest on our laurels. Excellent scientific research requires talent. The most accomplished scientists in the world need to be trained here, and attracted here. The UK is known to be excellent in research, and scientists of the highest quality from around the world want to come and work here, which can only be to the country's good.

The necessity to attract highly trained scientists from abroad has to be reflected in the UK's immigration policy.

The Government needs to show leadership in this area, by publically emphasizing that scientists are as welcome as entrepreneurs, ministers of religion and sports people, to come and work here. The Immigration Minister, Damian Green, has argued that he wants to encourage the

brightest and best migrants to come and work here. But this must not be merely rhetoric. He has to make sure that the best scientists from around the world know that they are welcome in the UK.

Science education also needs attention. People need an education that allows them to fully participate in a democracy that will increasingly require engagement with scientific matters. Teaching should be of a quality such that those pupils with the talent and inclination to become scientists are inspired to do so. This will be difficult if we continue as now, with nearly all primary school teachers, over a quarter of chemistry teachers, and nearly a third of physics teachers, having no specialist qualifications in science.

There should be greater attention on practical science in schools including natural history, reinforcing the fact that science is built on observation and experiment. Pupils must be inspired by the wonder of science, and need to understand why science generates reliable knowledge. At the very least, everyone leaving school should know the difference between astronomy and astrology.

I was inspired at school by my biology teacher Keith Neal. His focus on practical science and on communicating the wonder of science, was critical to me becoming a scientist. We need more Keith Neal's in our schools.

Most important for the UK is a culture shift to fully recognize what science can contribute. We should reawaken the spirit of the Enlightenment, a respect for science and rationality, a free sharing of ideas and thinking with people from all walks of life, revive the energy of the Industrial Revolution, and have the courage to take risks and be true entrepreneurs.

We can learn from the Lunar Society where scientists, intellectuals and entrepreneurs met together. But the world is more complex now. We have become more focused on specialist areas that are cut off from each other. Scientists are insufficiently exposed to other scientific disciplines. There are barriers between scientists and technologists and engineers, blocking the exchanges needed for innovation. There are further blocks between these communities, and those who lead the public services and industry who need the applications of science.

It is essential to break down these barriers, through increasing the permeability of both ideas and people between different sectors. With permeability will come more innovative ideas and greater mutual respect, leading to better progress in translating science into useful applications.

I want to the put these ideas into practice at the new Francis Crick Institute being built in London next to St Pancras Station. When it opens in 2015 it will house 1500 scientists in what may well be the biggest biomedical laboratory building in the world. It will not just be a place for scientific experiments, but also a place for experimenting in the way science is done. As Director of the Institute, I want to create a cultural and economic hot house of scientific ideas and applications, to make exciting discoveries improving our health and driving our economy.

I do not want scientists to stay in their labs all the time, I want them to mix with the best minds from industry, the city, the public services, the media, to spark off new ideas to help science benefit us all. It will be a place without departments or restricting hierarchies, with scientists free to pursue their own creative ideas in a highly interactive and open building. If it sounds a bit like anarchy, that is because it will be a bit like anarchy. It is often in mixed up and chaotic circumstances that the most creative work is done. Remember Harry Lime in the Third Man who said, "In Italy for 30 years under the Borgias they had warfare, terror, murder and bloodshed, but they produced Michelangelo, Leonardo Da Vinci and the Renaissance. In Switzerland they had brotherly love – they had 500 years of democracy and peace, and what did that produce? The cuckoo clock."

The Francis Crick Institute is a thrilling opportunity to create the world's leading biomedical research facility right here in the UK, attracting the best minds from all over the world, and could also be a model for getting our economy to work better.

Good science needs good long-term support, and the UK must look at the scale and the scope of the funding it provides for science, both from public and private sources. The Government has protected science in the recent cuts which is very welcome, but even so in real terms, support for science has been reduced. The Government needs greater courage to properly support its stated aspiration of harnessing science and engineering to rebalance the economy towards innovation-based sustainable growth.

The UK spends 1.8% of GDP on research and development, the Americans 2.9%, the South Koreans 3.7%. And we are dropping down International league tables for the production of patents.

An even greater problem is spend by industry in the UK on research and development, at present only 0.8% of GDP, less than half of the percentage spent in the US and Germany. This low level of investment in science from industry, means it lacks the research capacity and knowledge to reach out and exploit the scientific knowledge being produced. There needs to be a shift in the boardroom to understand and appreciate what science can bring, with more focus on the longer term. Typical of the problem is what has happened to the Utilities. In the years following privatization, there was a collapse in spend on research and development, good for short-term profits maybe, but not for long-term sustainability or long-term profits.

I am passionate about science because it has shaped the world and made it a better place, and I want to see science placed more centre stage in our culture and economy. Our present economic troubles have promoted a debate about the future of our economy, and that future must include a major role for science. We need a new Enlightenment, an Enlightenment for the 21st century, and Britain is the place to do it with its history of freedom, rationality, and scientific achievement. We need more science in Government, the boardroom, and public services, we need more funding for science, we need greater engagement with the public and a society comfortable with science, we need to convey the wonder of science, and what it contributes to our culture and our civilization.

If we want science to deliver all of this we must up our game, with the vision to think big, bigger than our competitors, and to imagine where we want to be in the future. Science can help us get us there, just as it did in the past. If we get it right our whole society will benefit. Science is, and always has been, one of Britain's greatest assets. I am optimistic that the time has come for a new deal between science and society to achieve all of these things. If we are to hold our own on the world stage, then it is time to make sure we don't take it for granted, but encourage, cherish and promote our science.

And I call upon us all to start now.

The Royal Society

The Royal Society is a Fellowship of more than 1,400 outstanding individuals from all areas of science, mathematics, engineering and medicine, who form a global scientific network of the highest calibre. The Fellowship is supported by over 130 permanent staff with responsibility for the day-to-day management of the Society and its activities.

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Through these activities, the Society ensures that its contribution to shaping the future of science in the UK and beyond has a deep and enduring impact.

For further information

The Royal Society
6 – 9 Carlton House Terrace
London SW1Y 5AG

T +44 (0)20 7451 2500
F +44 (0)20 7930 2170
E info@royalsociety.org
W royalsociety.org

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