The central importance of science in education

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Three hundred and fifty years ago - just a few years before this theatre was built - a small gathering of scientists who had first met here in Oxford during the English Civil War, decided to establish themselves as a formal group and to meet weekly in London to conduct, observe and discuss their experiments.

For many, this meeting - which led directly to the founding of the Royal Society - is seen as the birth of modern science. It marked a fundamental change in how we thought about the natural world; no longer arguing on philosophical or theological grounds about how the world must be, but seeking - through experiment, observation, and analysis - knowledge of how it actually was, highlighting the truth that the freedom of thought vital to science and its progress was led by the development in Britain ahead of other countries - first of tolerance and then of liberty.

That discipline of rational thought and the same joy of discovery founded on that tradition of liberty have delighted, challenged and inspired generations of scientists ever since.

When those Oxford scientists developed their empirical method three and a half centuries ago, it was more than simply an idea, it was an idea about ideas. An insurrection of rationality against dogma, after which the world would quite literally never be the same again

The methods these scholars developed didn't just teach us what to think. They taught us how to think.

The imagination, intellect and skills of those men - at that time and in this place – set new rules that changed their world and remain unchallenged to this day. And the whole world is still indebted to these giants of the British enlightenment.

And in this room today you - their heirs and successors - I know will acknowledge their greatness. And with access to knowledge and technologies they could never have dreamed of, yet which would not exist today had it not been for their astonishing legacy, will in our time and for our future - by your imagination, intellect and skills - add greatly to that legacy.

So I am honoured to have been invited to give this prestigious lecture and it is, I believe, fitting that in the year in which we celebrate the two hundredth anniversary of the birth of the British genius Charles Darwin, this lecture - given in honour of his great friend George Romanes and taking place in what was, if not the birthplace, then certainly the breeding ground of experimental science - should address some of the modern-day issues of the study to which Darwin and Romanes gave their lives' work.

For so many of us, the excitement of science captures our imagination - from seeing the bangs and bubbles of those first school chemistry experiments to learning of the landmark discoveries and inventions that have changed the way we live, and even the course of our history.

Because science redefines for us the boundaries of what we thought possible. And especially in these times - tough economic times for our world - we look to science to provide new solutions, new technologies, new opportunities to further our common goals.

Today we are having to address for the first time problems that are not just of a national dimension but of a global dimension.

We tend to think of the sweep of history as arching across many months and years - as if each minute leads inevitably to the next, before culminating finally in long-predicted events that we know as history.

But sometimes the defining moments of history appear suddenly and with no clear warning, and the task of leadership is to name them, shape them and move forward into the new world they create. We now know that we are living through the first financial crisis of a new global age. But it is more

than that: we are in a new world not just of global financial flows but the global sourcing of goods, the global mobility of people and through email, text and the web, instantaneous global communications. Suddenly the new frontier is that there is no frontier.

And this technology, this ability to communicate with each other and this new mobility that people enjoy is also creating for the first time in human history the potential for a truly global society.

This new global age brings huge opportunities but, also as we are seeing, massive insecurities. And so now we have to confront inescapable challenges which cannot be met without our working together.

We need a means of ensuring global financial stability and prosperity; of addressing climate change and energy needs; of ensuring security in a more mobile and potentially more dangerous world; and addressing the poverty and inequality that grievously scar the poorest parts of our world.

And surely facing this challenge we are fortunate to be able to summon up the best of scientific progress to minimise the insecurity of the new world while maximising the opportunities it presents.

Whatever is likely to happen, the world economy will almost certainly double in size in the next 20 years - as the people of China, India and Asia become consumers for the first time. That's twice as much business as today; twice as many opportunities. And among the winners in globalisation will be the industrialised countries that can create the high value added products and services and train the people with the highest possible skills to make and create them.

And so the economic role of science will be of even more importance than before. And when it comes to all the challenges of creating a truly global society - which require us to eliminate poverty, tackle climate change and mitigate the impact of disease around the world, it is science alone that can give us hope - of a global and sustainable response to the challenges of food and water shortages; of preserving our environment for future generations; of reducing death and suffering from infectious, malignant and degenerative disease.

These are the challenges that only science can answer.

Isidor Isaac Rabi, the US physicist who won the Nobel Prize in 1944 said that science is a great game where the playing field is the universe itself. What an inspiring image. It seems to me that science is also both the great achievement of humanity and the definition of its promise. And so, today, great responsibility lies here with you, as the guardians of our understanding of the miraculous reality that surrounds us every day.

At the time of the enlightenment it was thought that all scientific progress, all acquisition of knowledge, was good. It was, you could say, a view of science as a means of social progress, much as Adam Smith's view of markets was a means for economic prosperity.

But we know now it's not quite so simple: as Martin Luther King once remarked "our scientific power has outrun our spiritual power. We have guided missiles and misguided men."

And we saw how in the last century, humanity tarnished the reputation of science by associating it with some of the darkest moments in human history, in which science was at the service of the most cruel and destructive regimes and the power of science and scientists was grossly abused.

When I look at the situation still unfolding in the financial markets around the world today I'm struck by the parallels. We have seen clearly and spectacularly that unregulated markets have the potential for great and widespread harm; that the pursuit of wealth can be separated from the exercise of responsibility; and that free markets can become value-free markets.

So too we've experienced the potential of unregulated science to cause harm - intended or otherwise. And seen how in science, as in economics, our progress can outstrip our humanity.

And while every generation has to learn and relearn the risks and dangers, we cannot and must not now walk away from the potential of science; any more than the recent failure of international regulation in the global economy means that we should give up on the principle of free markets as we seek to make markets fairer.

But at this defining moment in the modern-day history of the British economy, is it not time to reconsider how to refocus our intellectual resources to reflect better the goals of our society. And to move away from an economy centred so heavily on financial services – and on finding ever more arcane ways to price complex derivatives - to one that is broader-based with a new focus on science and innovation.

A country whose young people are more inspired by those who give to the world, than by those who take from it.

And a nation that values Britain's great history of scientific achievement and that backs Britain's capacity for scientific discovery.

Quite simply, we know that the frontiers of social and environmental progress both here in Britain and across the world depend on science. But they also rightly depend on the boundaries placed on science by society. Getting the boundaries right will be challenging, difficult and painful, often requiring the most delicate and finely balanced of ethical judgements. But we can't afford to duck the challenge just because it will be hard, for while not everyone is in the business of science, science is everybody's business.

When Ghandi described the sins of the world - he spoke not just of 'politics without principle' - which you might recognise - and "wealth without work" - he also spoke of 'science without humanity'.

I believe that it's precisely - and only - by enlisting science in the service of humanity that we can hold out the hope of reaching the great progressive goals of our time. And that is our challenge today - as a nation and, increasingly, as a global society.

British science…from the double helix to the MRI scanner; from medicine to global communications; from the telephone to the television; from the origin of computer science to the creation of the World Wide Web; British science is amongst the world's best - and well placed to make a contribution to these great goals. And that is one of the many reasons I feel so proud to have been given the chance at this time to lead this country I love.

Time and again British scientists and British inventors continue to pioneer the great advances. British scientists first with cloning - and Dolly the sheep; a British research team - led by one of the world's leading heart surgeons, Sir Magdi Yacoub - for the first time grew part of a human heart from stem cells; a significant step towards the goal of growing whole replacement hearts from stem cells.

Whether it's the long reach of British scientists in identifying three new planets outside our own solar system - or new ways of growing gallium nitride for super-efficient LEDs which are already lighting up the façade of Buckingham Palace and costing less to run than an electric kettle - British scientists are continuously breaking new ground.

Let's just take one example: pioneering British research - that includes the provision of digital infrastructure in remote areas - which is enabling the testing of new technology with a sensor device that gathers data on air and soil temperatures - and informs crucial decisions about planting, fertilisation, irrigation, pest and disease control to help some of the poorest farmers in Africa maximise the yields of the crops they grow.

And let's bring this closer to home. For British science is not just helping people across the world – it is protecting jobs and livelihoods in Britain too.

For example, when British scientists used meteorological data to predict that midges bearing bluetongue virus would be carried to specific parts of the UK from the continent - they enabled selective vaccination of livestock and saved nearly £500 million, together with 10,000 jobs.

It has always been that scientists are seeing possibilities others must catch up with. In 1878, two years after Alexander Graham Bell had invented the telephone, the chief engineer at the post office is reported to have said that we had no need for it in Britain, as we still had plenty of messenger boys!

Though others have not even seen the full potential of their own work - such as the Boeing engineer who claimed “there will never be a bigger plane built” - as he stood proudly alongside his creation, after the first flight of his 247, a twin-engine aeroplane that held ten people.

As you - more than any audience - know: it is only through trial and error that great advances can be made.

There’s a story told about Thomas Edison who - having gone on to invent the light bulb - was asked whether it was true that he had first endured a hundred failures.

No, replied Edison, that wasn’t a hundred failures. It was a hundred small steps towards success.

And thousands of trials and millions of errors on - we have a scientific record to be proud of.
We have 78 British Nobel Prize winners in science. Four of the top ten universities in the world are British - including, of course, this great institution here at Oxford. And a higher share of our growth is delivered by science-based innovations than in any other industrial nation, including the US - which means that today the UK is second in the world only to America on the majority of leading scientific indicators and our science is the most productive and efficient in the G8.

And I believe a vital ingredient of our success is that UK scientists remain amongst the most outward looking and globally connected. With just 1 per cent of the world’s population, the UK undertakes five per cent of the world’s science and produces nine per cent of the world’s papers. And of the UK’s foreign-born adult population - around one-fifth are scientists, with over half of them originally from Asia - in particular from countries like China and India.

This is where we are. The question now is how we build on this strength to make Britain the best country in the world in which to be a scientist in the months and years to come.

The answer I believe has three parts.

First - we entrench investment in science as a national priority - maintaining our commitment to continue our path of raising investment in science across the board - targeting specifically the key sectors where we have a strong competitive advantage and bringing scientists and industry together in partnership - to underpin a new extended science base in the UK.

Second - we raise the status of science in education and in particular bring more people with science qualifications into teaching - so that we can maximise the support available for the next generation of great British scientists and use the downturn as the opportunity to shift away from over-dependence on financial services to do that. And do it now.

And third - we show that science matters to society and promote even more vigorously a positive public debate about the proper role of science in the service of humanity - improving public understanding and awareness and harnessing the power of science to tackle some of the great problems and challenges our society now faces.

Let me address each of these points in turn.

First - a new extended partnership between science and industry - supported by record Government investment in science.

In 1997, British science was suffering from a legacy of severe under-funding, especially in research, with dilapidated facilities, low morale and inadequate relationships with business.

On coming into office, this Government saw the urgent need for change and the huge value of investment in science. That’s why as Chancellor I set a ten-year framework which committed to maintaining public investment in science at least in line with the trend growth of the economy through the ten year period from 2004. And since 1997, investment in science has more than doubled in cash terms - an 88 per cent real terms increase rising to almost £6 billion a year by 2010/11.

Our investment in the research base has repaired physical infrastructure, created a critical mass of professional capacity in knowledge transfer and put research funding on a financially sustainable footing.

So today let me first be absolutely clear - that we will meet our ten-year commitment to maintain science spending with investment focusing on pure fundamental science as well as applied science. And that we will invest not just in specific projects but also crucially right across the science base that underpins our international reputation.

And let me also make clear - in meeting our ten-year commitment we will maintain the ringfence we have placed around science funding - protecting money for science from competing demands in the short-term and providing the sustained support the research community needs to deliver world-class results in the medium and long term.

Some say that now is not the time to invest, but the bottom line is that the downturn is no time to slow down our investment in science but to build more vigorously for the future. And so we will not allow science to become a victim of the recession - but rather focus on developing it as a key element of our path to recovery.

But I believe we must do even more than this if we are to win the battle for Britain's future in this new globally competitive age.

In recent weeks John Denham and Paul Drayson have raised important questions about how we can best focus on areas with significant growth opportunities in the coming decades. The debate about how science can help us out of the downturn is a crucial one. And we should be looking constantly at how to develop clear competitive advantages which will directly help the future British economy.

This does not mean compromising on fundamental research. But it will, as John Denham has said, mean working with scientists and those funding research to both identify potential priorities and then ensure that the research base works as much as possible to support them.

Across the world, other nations are now also stepping up their investment in science. President Obama is doubling America's basic science spend and his economic stimulus package includes over $21 billion of one-off investments in federal research and development. And it's not just America. Japan now has an ongoing spending target of 1 per cent of GDP on science and technology. China is growing fast from a low base, increasing its higher education R&D spend four-fold between 1995 and 2004 and its share of publications is now equal with UK.

And the smaller economies are also providing an emerging challenge. Iran has increased its share of publications ten-fold since 1998. And Finland - which invested extensively in science and technology while facing recession in the 1990s, now has the highest average impact for its scientific publications.

The experts tell us that - whatever happens in the next two years - over the next two decades there will be as many as a billion new skilled jobs to compete for - many of them requiring scientific expertise.

If we turn our back on that opportunity, batten down the hatches and retreat into a regressive protectionism, we will all be poorer. So to compete in this global marketplace; to meet the challenges of globalisation and seize the opportunities it presents, we must invest in the key sectors where Britain is well-placed to lead - from low carbon to the NHS and pharmaceuticals; from education to the digital and creative industries.

For as a nation we need to secure more than our share of jobs, trade and business in these sectors; with science, engineering and technology now - more than ever before - the foundation of Britain's economic success. This in turn will require a new focus, backed by priority national investment in skills, research and national infrastructure, and in major physical and intellectual capacity-building - as we make a fundamental shift in the underlying structure of the economy.

So we will invest more than at any time in our country's history, to make the next decade a decade where British scientific genius can create the low carbon, high skill, digital economy that we need. Our future must be one that will give us the benefits of globalisation while minimising its risks, an

economy more about robotics engineering than financial engineering, more about low carbon than high finance: a future where the financial sector is the servant of industry and never its master.

And in addition to investing directly in these new sectors ourselves, I can also announce that we will be looking for ways of working - through the Research Councils with our American partners. Ways that will be of mutual benefit and allow us therefore to take advantage of the additional American investments resulting from President Obama's economic stimulus package.

Excellent links between the UK and US on science and innovation already exist. For example, the UK has recently announced £4 million for three exciting new UK-US science bridge projects on photonics, energy and healthcare. These bring together six top UK universities with centres of excellence in the US. And I want to see more of such new transatlantic partnerships.

Our approach is not that of picking winners or protecting existing industry from the market. Rather it is a clear strategic assessment of our future - based on the strengths and comparative advantages that Britain already has - to create a framework for prioritised long-term investment which allows the market to function effectively and prepares our country to emerge from the downturn in the strongest possible position.

In recent years - as well as investing in science - the relationship between business and our universities has been radically strengthened. And in accepting the recommendations of the review by Lord Sainsbury - whom I thank for his groundbreaking work - we have given more support through the higher education innovation fund to business-facing universities, setting targets for knowledge transfer from Research Councils. And as a result, the early stage hi-tech enterprises we have today are the strongest we have had for 30 years.

But the downturn has brought a precipitous decline in funding for spin-offs, and the venture capital market is now failing us just when it is most needed. We understand that the availability of venture capital finance is key to ensuring the value and intellectual property in our research base is developed and to enable new products to come to market and contribute to future UK competitive advantage.

And it is vital that our portfolio of early-stage, high-value businesses survive the downturn to secure our long-term future competitive advantage. So we must act so we do not lose the value which has been created in the ideas and intellectual property arising from the sustained investment in research over the past ten years.

As Sir William Osler once said: in science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs.

That's why Lord Drayson is urgently looking at early-stage high value, high intellectual property companies, to remove the barriers they face in obtaining the venture capital they need to help them bring products to market, and to position them to develop further as the economic cycle turns.

So the success of our plan for building the knowledge economy as the best route to recovery hinges on continued investment in science today and on our ability to commercialise its applications - to turn scientific genius into successful technology-led economic growth for Britain. Because this is how Britain will invest our way into the future.

But to secure the long term future of British science our second priority must be to ensure that Britain produces the great scientists of tomorrow to follow in the path of those we have today.

Independent projections suggest there will be almost three million science, maths and technology related jobs in Britain by 2017. So we're going to need to unlock the very best of British scientific talent in the years ahead. And to do that we must improve scientific education for all.

One of the biggest stumbling blocks in science education is that in the comprehensive sector only a minority of schools offer three separate sciences as opposed to combined science qualifications. This significantly impacts on the likelihood of a student getting good A-Level grades - or indeed even sitting STEM-subject A-Levels in the first place.

In the last two years, we have seen in Britain the first consecutive increases in take-up of physics at A-Level, but that follows a twenty-year decline here, in a world that now sees 1.2 million Chinese and Indian engineering graduates entering the global jobs market each year.

And of course, those who don't do A-Levels in science are ill-equipped to study it at university. So right from age 14, this lack of options for studying science in our state schools is preventing young scientists from developing their talents and making it much harder for those from state schools to study these subjects at our leading universities.

Historically, a real problem has been the relatively small number of specialist science teachers in mainstream comprehensive schools who have the in-depth subject knowledge to teach single subject science - and to stretch and challenge the brightest students.

But the downturn fundamentally changes that equation. That is why we will guarantee that where redundancies are declared in industries with a number of suitably qualified graduates who are interested in teaching maths and science, the Training and Development Agency for Schools will arrange for personalised support from education consultants within one week of the request, with the possibility of further tailored advice from regional careers consultants to follow. Because - for them, for our young people, and for the future of Britain - we must seize this opportunity to bring new people with science and maths qualifications into the teaching profession.

And building on this, we are today setting a national ambition that this country will educate the next generation of world class scientists; and that to do so we will work towards all pupils having access to single subject science teaching - with a guarantee that 90 per cent of all state schools will offer this within the next five years.

Alongside this we will set a clear aim to double, by 2014, the number of pupils in state schools taking triple science. This will mean over 100,000 pupils a year. And - since we have already passed our initial A-Level maths entry target for 2014 - we will replace this with a new target of 80 thousand young people taking A-Level maths within the next five years.

And from September 2011, the new Diploma in science will be available in schools and colleges - offering a fantastic opportunity to get young people involved in doing science whilst working towards a high quality qualification that is valued by both employers and higher education providers.

And we should remember it is not just about producing the scientists of tomorrow, but the engineers of tomorrow too. Engineering is still today in some circles regarded as a lesser subject - and too many young people seem to regard it as an unattractive career option.

That is not just wrong and absurd. It is deeply damaging to Britain's future economic prospects. Engineers built our history and they will build our future. So many of the great challenges we face today require engineering solutions, built on scientific discoveries - from the challenge of designing low carbon energy and transport systems, or of building the new digital networks, to creating the new manufacturing industries which will sustain Britain's future wealth.

So I want our young people growing up understanding the value society places on engineering and scientific discovery - and on our young scientists focusing on the many socially productive uses of science. Improved science education doesn't just provide the workforce of tomorrow. It determines our scientific literacy - which in turn shapes the crucial debates which set the societal boundaries within which science operates.

So the third priority is a real duty on the scientific community to engage with the public to explain the issues and enhance the role and prestige of science in society. Afterall, the public are the investor and so we need their support for scientific research and discovery. But in return for that our scientists get the academic freedom from which great things can happen.

Yet there is a challenge to our scientific community today. Over half of those who responded to last year's public attitudes to science survey said science was too specialist for ordinary people to understand.

So we have to explain it better and help people to see science as something that is not elitist. And that's what the "So What, So Everything" campaign which the government launched last month is aiming to do; to present science not as a list of facts to know or learn but as a way of looking at the world around us; to invite people to think about the joy of discovery – and science as it affects their world - highlighting the role of science in the achievements of popular heroes - like Britain's Olympic winning cycling team and the Formula One World Champion Lewis Hamilton - who have been able to push at the boundaries of possibility because of the power of British science and technology.

And did you know that Britain has held the World Record in land speed longer than any other country? And that in Project Bloodhound, James Burch and Richard Noble are working to enable Britain to break that record again by reaching 1,000 miles per hour.

It's an open project designed to involve and inspire young scientists all the way from primary school to those in further and higher education - and capture their imagination - so that more young people choose to embrace science and scientists get the recognition they deserve, thereby helping us to create a modern scientific culture for our times, just as in the Nineteenth Century, when scientists like Michael Faraday and James Clerk Maxwell were the celebrities of their day.

And as we develop this public awareness and appreciation of science, so we must build on Britain's strong tradition of debating key ethical issues. In the past the image of science has I believe suffered in the public's mind through our initial experiences of animal testing, GM crops and stem cells. And much of the media coverage that has dominated people's view of these issues in the past has served the cause not of legitimate progress, but of fundamentalism.

But I believe we have learnt lessons from this - and we are now seeing a better, more balanced debate with the public. Indeed, we should be reassured about the way we now approach these difficult issues; that we have come up with appropriate frameworks in controversial areas for responsible development; and have increased and maintained investment in cutting edge science as a result.

It's a central component of my enduring optimism in the long-term future of Britain.

I am sure we would all agree that having the scientific capacity to do something doesn't necessarily mean that it's right - any more than the risk of technology falling in to evil hands makes the creation of that technology necessarily wrong.

The real challenge is to establish in open, reasoned discussion and debate the necessary balance and the effectiveness of the regulations and restrictions that society imposes as a result.

We have to make the positive case for science as together we address the great problems and challenges our world now faces - from climate change, through food and water security to the control of disease.

For together we can make cutting-edge science the informed ally of moral purpose not - as it is too often still today - the misunderstood enemy of moral principle.

So it's important we examine such issues as they arise: through the data; through facts not prejudice; and with a full understanding of the social context in which we are operating.

Scientists need to recognise the reasonable concerns that others have about what they do. For example, to address the difficult questions around animal testing we've established the National Centre for the "Three Rs" - which promote the replacement, refinement and reduction of the use of animals in research; core principles first developed by Russell and Burch at the end of the 1950s - that seek to minimise the use of animals and maximise the search for alternatives wherever possible reducing or replacing animal testing - and refining any processes and techniques that are used to minimise hurt and harm.

More recently, we have faced difficult decisions over the use of stem cells. In the 10 years since James Thomson's discovery, scientists have shown that embryonic stem cells have the potential to help create replacement cells for tissues and organs including the heart, liver and pancreas.

Britain is at the forefront of this research and responsible for much of the progress worldwide. We have had a full and open debate in our society - patiently and with full regard for religious concerns - and have sought to introduce clear laws which permit the use of stem cells within a clear, managed, legal framework, subject to the strictest supervision and respectful of people's ethical positions.

For me stem cell research is an inherently moral endeavour that with a sincere respect for religious beliefs of different faiths - and within a framework that secures a deep commitment to the highest ethical standards - can save and improve the lives of thousands and ultimately millions of people.

Already it is in practical use for conditions including leukaemia and heart disease, and makes it possible to contemplate new and effective treatments and cures for diseases that have afflicted mankind for centuries including: Parkinson's, Alzheimer's and the various forms of cancer that have touched almost every British family – and are very much in the minds of the people of Britain today.

To relieve some of the worry that so often goes alongside the heartache, we will this year remove prescription charges for those battling cancer. But the real hope lies in cancer treatment itself. And I have the ambition that we all have– as has President Obama - that in this generation we will seek and find a cure for cancer.

It is for this cure and others that our country is spending, over ten years, £15 billion, more money than ever on medical research.

Britain and the USA are leading in research on cancer treatment - with more cancer trials here in Britain than anywhere on the planet. In Britain part of that is because of the enormous generosity of the British public in making charity donations. Part of it is the result of the single greatest comparative advantage Britain holds - the NHS.

No other country has a publicly owned healthcare system quite like ours. And it offers us the opportunity to be a world leader in medical research - and hence a world leader in life sciences. And with that comes the potential for growth and jobs that will help to rebalance our economy and fund future investments in research. And the new Government Office for Life Science is being set up precisely to ensure we fully realise the potential of this leadership position.

Medical science is moving swiftly and already we can begin to see the implications for how - as a society - we will need to manage that. Take - for instance - the analysis of DNA and how that's evolving.

Looking into the future, we must now anticipate developing new cancer medicines that take account of genetic difference stratifying cases - and perhaps populations - by their genomic or DNA make-up and targeting drugs for cohorts with specific characteristics. And to achieve this, medical scientists will need to get permission from patients for access to their DNA records.

But already there are signs of people's readiness to participate. One of Breakthrough Breast Cancer's current projects has seen 100,000 women in the UK volunteering to take part - including offering blood samples for genomic analysis. And women taking part have been encouraging their children and grandchildren to get involved at the same time so that if ever they too developed Cancer the potential to treat them would be much enhanced.

And there is a new direct-to-consumer model developing via the internet - mostly outside the UK - with a number of companies now offering DNA testing or profiling services. And - though experts and practitioners in genetic testing regard it as still a niche market - consumer awareness - and with it interest in such tests - appears to be growing.

So it's clear that the analysis and handling of genomic information is one of the most radical and far-reaching developments in current medical science. So we have to ensure both as Government and as a society that, as the opportunities for people to access genomic information spread, the regulation and boundaries set for the use and control of such data evolve just as rapidly.

But it is hard not to see how - with the appropriate safeguards in place the potential of genomic information might prove to be a 21st century moment - a vast expansion of the boundaries of

scientific understanding that holds breath-taking possibilities for the future effectiveness of medicine in Britain and across the world.

And that is the true power of science working in the service of humanity.

Today every major country in the world is focusing resources and talent on building its scientific capability for the future of its people.

And we should thank our scientists for all they are doing - and celebrate too the enormous generosity of spirit they have shown - like that of Jonas Salk who developed the vaccine for polio and who refused to patent it because he said it would be like patenting the sun. Or Oxford's own Tim Berners-Lee whose gift of the internet to the world has truly brought people closer than ever before. Or Sir John Sulston and his team who opened up the path-breaking research in the human genome project to everyone

Many of the challenges we face today are international - and whether it's tackling climate change or fighting disease - these global problems require global solutions. So as a nation we have both to compete in the global market but we also have to play our part in supporting the work of an international scientific community.

That is why it is important that we create a new role for science in international policy-making and diplomacy. And it is why I can announce today that the Foreign Secretary will shortly be appointing the first ever Chief Scientific Adviser at the Foreign Office. Someone who will work with Hilary Clinton's Chief Science Adviser - and with other partners around the world - to place science at the heart of the progressive international agenda: from tackling poverty to the case for - and practical mechanisms for - nuclear disarmament ahead of the review conference of the nuclear non-proliferation treaty next year.

With the strength our scientific community, our commitment to invest in the future of science and our steadfast determination to build a global partnership of nations succeeding together not failing apart - Britain can be an international hub for scientists around the world.
And this great City and University - a focal point for the future; just as it has been in the past.

At this defining moment in history, as Darwin could have said, the origin of our future is at stake. But I truly believe that British science can answer the call - and with it secure our economic future for generations to come.