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Speech

## PM speech on science and modern Industrial Strategy: 21 May 2018

Prime Minister Theresa May spoke at Jodrell Bank.

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## Introduction

Jodrell Bank was established in 1945, in a Britain rebuilding in the aftermath of the Second World War.

Motors from the gun turrets of battleships were built into the machinery used to rotate the dish of the awesome Lovell Telescope behind me.

The first scientists to use it were continuing research into radar which had begun in wartime, with the purpose of defeating our enemies, but which they continued in peacetime, to extend human knowledge.

Memories were fresh of the destruction that had been wreaked through what Winston Churchill called 'the lights of perverted science'.

But stronger than the doubts about technological change was a faith in the potential of scientific inquiry to overcome the great challenges of their time – want, disease, ignorance and squalor – and to light the path to a better future. They were men and women who stood at the threshold of a new age.

Their grand-parents lit their homes with oil lamps and travelled by horse and cart, but they would live to see jet travel and space flight.

Jodrell Bank is an icon of the United Kingdom's tradition of scientific achievement and is today at the cutting edge of twenty-first century discovery.

And as I look towards the future, that spirit of scientific inquiry, and its power to shape a better tomorrow, is

at the heart of my vision.

Because the world today stands at the threshold of a new technological age as exciting as any in our past.

Great changes in how we live, how we work, how businesses trade will reshape our economy and transform our society in the years ahead.

This technological revolution presents huge opportunities for countries with the means to seize them.

And Britain is in pole position to do just that. We are ranked first in the world for research into the defining technologies of the next decade, from genomics and synthetic biology, to robotics and satellites.

With 1 per cent of the world's population, we are home to 12 of the top 100 universities.

And London is Europe's leading tech start-up cluster, attracting more venture capital investment than any other city.

But this success is not automatic. We are at the forefront of scientific invention because we embrace change and use regulation not to stifle but to stimulate an environment for creativity.

We have great universities because we have strengthened historic institutions and nurtured new intellectual powerhouses with public investment.

Britain's businesses can take on the world because they have access to a skilled workforce and modern infrastructure.

Key to our success has been the combination of individual ingenuity and ambition with government action to invest in the future.

## **British scientific achievement**

UK global leadership in science and innovation is one of this country's greatest assets.

For centuries Britain has been a cradle of scientific achievement.

William Harvey's discovery that blood circulates around the body provided the basis for modern physiology and led directly to every great medical advance of the last 400 years.

Isaac Newton's establishment of the laws of motion, optics and gravitation defined the parameters of physics and laid the foundations on which modern science rests.

Michael Faraday's discovery of electromagnetic induction unlocked the potential of electricity to light up the world and power the modern age. Every day, we benefit from the work of generations of British scientists and engineers. Every time we use a computer or go online, we benefit from the genius of Alan Turing and the foresight of Sir Tim Berners-Lee.

Every journey in an airliner is powered by the turbo-jet technology pioneered by Frank Whittle.

Every day my life and the lives of millions of people around the world are made infinitely better because of the ground-breaking work on the structure of insulin by Dorothy Hodgkin.

Each of these scientists and inventors has an inspiring story of human achievement borne of hours of

patient labour from which we all reap the rewards.

Contemporary British science is just as inspiring. Developing gene therapies to treat – and even cure – diseases that until now have been beyond us.

Creating new materials like graphene that open-up opportunities across industry and medicine – from lighter display screens to synthetic bone tissue.

Producing CT and MRI scanners to provide new ways of seeing inside the body to diagnose disease and target treatments.

Scientific research is a noble pursuit and a public good – whether or not it leads directly to a commercial application.

But when a discovery does have the potential to create or transform an industrial sector, time and again British entrepreneurs have been the first to capitalise on it.

In the eighteenth century, Stoke-on-Trent became the ceramics capital of the world after Josiah Wedgwood industrialised the manufacture of pottery.

In the nineteenth century, George Stephenson made Newcastle the first city anywhere to export railway locomotives.

In the twentieth century, Arthur Pilkington made St Helen's the global centre of innovation in glassmaking.

The great towns and cities of Britain grew up as global centres of innovative production.

However, the nature of innovation and progress is that new technology inevitably replaces old.

And in the twenty-first century, some parts of the country that once thrived because of innovation and technology have seen the jobs and opportunities of the past fall away.

But in others we have seen Britain's capacity for invention and reinvention create twenty-first century success stories:

- Cardiff has gone from exporting coal to pioneering in semiconductors.
- Dundee from jute to computer gaming.
- Hull from whaling to wind-turbines.

Our challenge as a nation, and my determination as Prime Minister, is not just to lead the world in the 4th industrial revolution – but to ensure that every part of our country powers that success.

That is what our modern Industrial Strategy is all about.

Investing in science and research to keep us at the forefront of new technologies and the benefits they bring.

Nurturing the talent of tomorrow - through more outstanding schools, world-leading universities and the technical skills that will drive our economy.

And transforming the places where people live and work – the places where ideas and inspiration are born – by backing businesses and building infrastructure not just in London and the South East but across every

part of our country.

## **Science at heart of a modern Industrial Strategy**

Government has always had a crucial role in supporting scientific research and the technological advancements that flow from it...

...from the founding of the learned societies under royal patronage in the seventeenth century to the expansion of state-funded research in universities through the twentieth century.

In the last few years, government support has helped create new landmark institutions, like the Francis Crick Institute - Europe's biomedical research facility – and the Aerospace Technology Institute in Bedford – leading on research and technology in the aerospace sector.

And in the Industrial Strategy, we have made a commitment to take our support for UK science and technology to another level.

£7 billion in new public funding for science, research and innovation: the largest increase for 40 years.

But to truly succeed we will go even further.

As a government, we have set the goal of research and development investment reaching 2.4 per cent of GDP by 2027 - more than ever before.

That could translate to an additional £80 billion investment in the ideas of the future over the next decade.

But even that figure fails to capture the scale of the possibility this will create.

Because science and technology have a dynamic relationship.

The scientific breakthroughs of today will lead to technological advances which themselves open the door to further scientific discovery, the likes of which are beyond our imagination.

And it won't just be public funding - our R&D target covers the combined power of government and business alike.

That is what the Industrial Strategy is all about - not just the state spending money but using smart public investment to harness private funding.

Not government running enterprise, but a strategic state using its power and influence to create the right conditions to allow us to thrive in the long term.

A strategic approach means ensuring we have an education system that gives young people the skills they need to contribute to the economy of the future.

That means more free schools and academies providing great school places, a curriculum that sets the highest standards, and proper support for our teachers to deliver it...

It means more rigorous science GCSEs preparing young people better for further study and work, and more young people going on to do sciences at A-level.

And to attract talented science graduates into the teaching profession, we are offering tax-free bursaries

worth up to £26,000 in priority subjects.

And it means going even further in the future.

Transforming technical education with new high-quality T-levels that are every bit as good as A-levels.

New Institutes of Technology to provide higher-level education and training.

And a national re-training scheme to help workers of all ages adapt their skills to the jobs of tomorrow.

This is action from a strategic state to drive policy changes that will benefit our economy, our society and the individuals we serve.

And it's not just in education.

A strategic approach means...

...renewing and extending our infrastructure with faster trains, bigger stations, better road connections...

...delivering next generation mobile and broadband connections, with faster speeds and better coverage...

...ensuring we have the right regulation, modern employment standards, effective corporate governance rules.

It means government doing what only it can do: fixing the essential foundations of our economy.

That allows researchers, innovators and businesses to do what only they can do: generate and develop the great ideas, products and services that create jobs and produce growth.

And if we do this – if we get the essentials of our economy right – we can focus our talents and ambition on seizing the opportunities of the future.

## **Grand challenges**

We cannot predict the future or guess what technological or scientific breakthroughs might lie just around the corner.

But we can observe the long-term trends that are shaping change in our world today and which will drive and demand innovation in the years ahead.

We know that artificial intelligence and the big data revolution is transforming business models and employment practices across all sectors of the economy – especially in services, which are so important to our country.

We can see that a rising global population and ever-increasing urbanisation, combined with new transport technologies, are driving profound changes in how we move people and goods around our cities and countries.

We know that our society here in the UK, and in other developed countries around the world, is getting older – creating new demands and opportunities.

And the international determination to address climate change and deliver clean growth in the future is one

of the facts of our time – and one of the greatest industrial opportunities of all time.

The modern Industrial Strategy identifies these four Grand Challenges as the areas of enormous potential for the UK economy.

By channelling our efforts into meeting them – building on our strengths in science, innovation, and commerce – we can develop technologies to export around the world, we can grow whole new industries that bring good jobs across the UK, and we can achieve tangible social improvements for everyone in our society.

## **Four missions**

From John Harrison's development of the marine chronometer, to the sequencing of the human genome and treatments to tackle the AIDS crisis...

...we have seen throughout our history that setting ambitious and clearly-defined missions motivates human endeavour.

There is huge potential in a missions-based approach to drive faster solutions – and it is an approach being pioneered here in the UK, by University College London's Commission on Mission-Oriented Industrial Strategy.

So today I am setting the first four missions of our Industrial Strategy – one in each Grand Challenge.

If they are to be meaningful, they must be ambitious and stretching.

That means that our success in them cannot be guaranteed.

But I believe that by setting a high ambition, we can achieve more than we otherwise would.

So these are the missions I am setting today.

## **AI and data**

First, as part of the AI and Data Grand Challenge, the United Kingdom will use data, artificial intelligence and innovation to transform the prevention, early diagnosis and treatment of diseases like cancer, diabetes, heart disease and dementia by 2030.

Late diagnosis of otherwise treatable illnesses is one of the biggest causes of avoidable deaths.

And the development of smart technologies to analyse great quantities of data quickly and with a higher degree of accuracy than is possible by human beings opens up a whole new field of medical research and gives us a new weapon in our armoury in the fight against disease.

In cancer, our ambition is that within 15 years we will be able to diagnose at a much earlier stage the lung, bowel, prostate or ovarian cancer of at least 50,000 more people a year.

Combined with the great treatment and care provided by our NHS, that will mean every year 22,000 fewer people will die within five years of their diagnosis compared to today.

We will work with industry and the medical research community to announce specific ambitions in a range

of other disease areas over the coming weeks and months.

Achieving this mission will not only save thousands of lives.

It will incubate a whole new industry around AI-in-healthcare, creating high-skilled science jobs across the country, drawing on existing centres of excellence in places like Edinburgh, Oxford and Leeds – and helping to grow new ones.

## **Healthy ageing**

Second, through our healthy ageing grand challenge, we will ensure that people can enjoy five extra healthy, independent years of life by 2035, whilst narrowing the gap between the experience of the richest and poorest.

We are living longer lives because of medical advances, better drugs, healthier lifestyles, and safer workplaces.

It is a sign of our success, of our progress as a society, and is to be celebrated.

But as we extend the years of our life, we should also work harder to increase quality of life in our later years.

That should not just be the preserve of the wealthy – everyone, of every background and income level, has the right to enjoy a happy and active retirement.

We can do that by supporting more people to stay happy, healthy and independent in their own homes for longer, instead of going into hospital.

It will take a collective effort to achieve this.

Employers can help, by meeting the needs of people who have caring responsibilities and by doing more to support older people to contribute in the workplace – and enjoy the emotional and physical benefits of having a job if they want one.

Businesses can contribute, and benefit, by supplying the needs of a growing market.

Innovative and well-designed products and services – from housing adaptations that make our homes safer for older people to live in, to smart technologies that help people continue to enjoy life if they have a health condition.

These innovations can also be exported to a rapidly growing market around the world.

And we can all play our part – by making healthier lifestyle choices ourselves, and by supporting our friends and neighbours as they get older.

We can build a stronger society, where more people can contribute their talents for longer and fewer people face loneliness and isolation.

## **Future of mobility**

Third, in the future of mobility grand challenge, we have a mission to put the UK at the forefront of the



design and manufacturing of zero emission vehicles and for all new cars and vans to be effectively zero emission by 2040.

Technology is revolutionising how we power vehicles, how they are driven, how we navigate and how we access information about public transport.

Britain led the world into the railway age. We pioneered jet air travel.

By putting the UK at the forefront of the twenty-first century transport revolution, we can ensure our automotive sector – one of our greatest success stories – continues to thrive and create good jobs across the country.

We can make our towns and cities cleaner, safer and more productive places to live and work.

We can set a global standard for managing technological change to maximise economic and environmental benefits.

We will work with industry to achieve this ambition, and share the benefits this opportunity presents.

## **Clean growth**

And fourth, in the clean growth grand challenge, we will use new technologies and modern construction practices to at least halve the energy usage of new buildings by 2030.

Heating and powering buildings accounts for 40 per cent of our total energy usage.

By making our buildings more energy efficient and embracing smart technologies, we can slash household energy bills, reduce demand for energy, and meet our targets for carbon reduction.

By halving the energy use of new buildings – both commercial and residential – we could reduce the energy bills for their occupants by as much as 50 per cent.

And we will aim to halve the costs of reaching the same standard in existing buildings too.

Meeting this challenge will drive innovation and higher standards in the construction sector, helping it to meet our ambitious homebuilding targets and providing more jobs and opportunity to millions of workers across the country.

It will be a catalyst for new technologies and more productive methods, which can be exported to a large and growing global market for clean technologies.

These four missions are just the beginning – and in setting further missions across the four grand challenge areas, we will work closely with businesses and sectors.

In each one of these four missions, scientific and technological innovations have the potential to create jobs, drive economic growth across the country and deliver tangible improvements for everyone in our country.

This represents a level of ambition every bit as high as that which created Jodrell Bank and rebuilt Britain in 1945.

We live in a different world today. Our economy is more globalised. Our strengths are in services, as well

as in manufacturing. Our population is older.

And the Industrial Strategy sets its sights on our future, not our past.

As we look towards that new future for the UK outside of the European Union, the UK's ingenuity and creativity will be what drives our progress as a nation.

## Science and Brexit

William Wordsworth described the statue of Sir Isaac Newton that stands in the chapel of Trinity College, Cambridge as being 'the marble index of a mind forever voyaging through strange seas of thought, alone.'

That romantic image belies the truth that the essence of scientific progress is not private contemplation, but collaboration.

Nothing is achieved in isolation and it is only through co-operation that advances are made. Every great British scientist could only reach new frontiers of invention because they built on the work of others, exchanged ideas with their contemporaries and participated in an international community of discovery.

William Harvey learned medicine at the University of Padua.

The first secretary of the Royal Society, Henry Oldenburg, was an immigrant from Germany.

The discovery of DNA in Cambridge was the work of an Englishman, Francis Crick; an American, James Watson; a born New Zealander, Maurice Wilkins; and a descendent of Jewish immigrants from Poland, Rosalind Franklin.

Indeed Newton himself put it best when he wrote that, 'if I have seen further it is by standing on the shoulders of giants'.

Science is an international enterprise and discoveries know no borders.

The United Kingdom today is at the centre of a web of international collaboration.

Our immigration system supports this, with no cap on the number of the students who can come to our universities, and thousands coming every year, learning from some of the finest academics and contributing to the success of some of the best universities in the world.

Indeed, since 2010 the number of overseas students coming to study at UK universities has increased by almost a quarter.

The UK will always be open to the brightest and the best researchers to come and make their valued contribution.

And today over half of the UK's resident researcher population were born overseas.

When we leave the European Union, I will ensure that does not change.

Indeed the Britain we build together in the decades ahead must be one in which scientific collaboration and the free exchange of ideas is increased and extended, both between the UK and the European Union and with partners around the world.

I know how deeply British scientists value their collaboration with colleagues in other countries through EU-organised programmes.

And the contribution which UK science makes to those programmes is immense.

I have already said that I want the UK to have a deep science partnership with the European Union, because this is in the interests of scientists and industry right across Europe.

And today I want to spell out that commitment even more clearly.

The United Kingdom would like the option to fully associate ourselves with the excellence-based European science and innovation programmes – including the successor to Horizon 2020 and Euratom R&T.

It is in the mutual interest of the UK and the EU that we should do so.

Of course such an association would involve an appropriate UK financial contribution, which we would willingly make.

In return, we would look to maintain a suitable level of influence in line with that contribution and the benefits we bring.

The UK is ready to discuss these details with the Commission as soon as possible.

## **Conclusion**

What I have set out today – unprecedented investment into science and research; four missions to drive businesses, academia, and government to meet the Grand Challenges of our time; and a clear commitment to extend our international collaboration after Brexit – build a positive vision for our country's future.

An open and innovative economy.

The best place to start and grow a high-tech business.

An outward-looking country, open to talent and ideas from around the world. A global centre for scientific discovery and creativity, where progress is driven by an optimism about the possibilities technological change can bring.

There is no escaping the complexity of the challenge, but there should be no mistaking the scale of the opportunity before us either.

The world is about to change – and is indeed already changing – at a remarkable pace.

Technologies with the potential to transform our society will come of age in the years ahead.

This is an exciting time to be alive – and rich in possibility for the curious, the inventive and the determined: the children in schools today studying STEM subjects in record numbers thanks to our education reforms.

The undergraduates from an ever more diverse set of backgrounds now embarking on higher studies.

The aspiring engineers and skilled workers who will benefit from our reforms to technical education over the coming years.

The young researchers from around the world, starting their careers working in British laboratories.

All have the chance to be part of one of the most exciting periods of discovery the world has ever known.

Amongst their number will be names to be inscribed alongside the greatest figures of the past on the honour roll of scientific achievement.

And together, we can continue a tradition of innovation that will extend our horizons and transform our lives.

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