SCIENCE MUSEUM GROUP

EXPANDING OUR HORIZONS

ANNUAL REVIEW 2017–18

SOYUZ HITS THE ROAD

ROBOTS ARE ON THE MARCH

A FEAST OF FESTIVALS

MAGIC OF MATHEMATICS

ILLUMINATING INDIA

ALL GO AT LOCOMOTION

INDIA IN A SPECIAL LIGHT

Illuminating India celebrated the country's rich cultural and scientific history

The *Illuminating India* season brought together the Indian diaspora in the UK, culminating in a visit to the Science Museum in April from HRH The Prince of Wales and the Indian Prime Minister, Narendra Modi, during the Commonwealth Heads of Government summit. The Living Bridges event, organised by the Foreign and Commonwealth Office, saw Prince Charles and the Indian PM touring the exhibition *Illuminating India: 5000 Years of Science and Innovation* with curator Matt Kimberley and Science Museum Group director Ian Blatchford. The Prince of Wales left the reception in the Jaguar I-Pace, a new zero-emissions electric car produced by Jaguar Land Rover, which is owned by the Indian Tata Steel company.

A hugely popular event series ran alongside the exhibitions and new work by artist Chila Kumari Burman, and included a screening of Oscar-winning film *Slumdog Millionaire* and Q&A with Danny Boyle, a tea-blending workshop and a weekend of activities for families. 'I originally asked Chila for one modest painting inspired by India but she was so inspired by the exhibition she presented us with 29 pieces of artwork and created a glittering tuk-tuk that welcomes visitors as they enter the museum,' said Blatchford.

The then Secretary of State for Culture, Media and Sport, Karen Bradley, sent a recorded message to the season launch event to 'convey my congratulations and those of the entire UK Government. It is especially fitting that tonight the Science Museum, which is the most visited museum in the UK by school groups, celebrates India's contribution to science, technology and mathematics.' She went on to thank the British High Commission and British Council, notably Baroness Prashar, deputy chairman; and Alan Gemmell OBE, director, British Council India.

She extended a warm welcome to the Indian High Commissioner, His Excellency Mr Yashvardhan Sinha, who told the guests that it was important that the people of his country and the UK connect and share, 'not just what we did in the past but what we are going to do in the future.'

Illuminating India is an outstanding example of collaboration between the UK and India – supported by the Bagri Foundation, the Helen Hamlyn Trust and the John S Cohen Foundation – it has brought together organisations including the University of Oxford Bodleian Libraries; the Alkazi Foundation, the Survey of India, the British Council and the Indian diaspora, forming a living bridge between two great nations.

From top left, clockwise: director Danny Boyle, external affairs director Roger Highfield, Eugenia Chen and Venki Ramakrishnan in discussion and the Prince of Wales welcoming the Indian PM, Narendra Modi, to the Science Museum

'Thank you for the contribution that the Science Museum made to the UK Commonwealth Summit, and the visit of Indian Prime Minister, Narendra Modi. I am very grateful for the role you played in making this happen'

Matt Hancock, Culture Secretary

'Witnessed the Illuminating India exhibition with The Prince of Wales. The exhibition showcases India's rich history in science, technology and innovation'

Narendra Modi, India's Prime Minister

RETURN TO CONTENTS PAGE

‘This is the cradle of the Industrial Revolution, it’s fantastic history’

Vince Cable, Liberal Democrat leader, on the Museum of Science and Industry

‘When I visited the National Science and Media Museum as a kid I was captivated by the idea of the animated image. So it was a thrilling and surreal experience to be exhibiting Thresholds in the museum’

Mat Collishaw, artist

‘The National Railway Museum is best placed to showcase both the historical and contemporary advances in railways in a new, modern world-class building’

Sir Peter Hendy, chairman of Network Rail

‘The Science Museum presents incredible opportunities for people to engage with some of the most important technological developments of the last two centuries. It tells the powerful story of human progress’

Eric Schmidt, Board Member and Technical Advisor, Alphabet

OUR FIVE WORLD-BEATING MUSEUMS

Science Museum, London
National Railway Museum, York
Museum of Science and Industry, Manchester
National Science and Media Museum, Bradford
Locomotion, Shildon

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or for corporate membership and patrons see page 59

THE YEAR ON VIDEO

sciencemuseum.org.uk/annual-review-video

SCIENCE MUSEUM GROUP ANNUAL REVIEW 2017–18

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Cover image: The Sokol KV-2 emergency spacesuit worn by British ESA astronaut Tim Peake during the Principia mission to the International Space Station, 2015-16. Recently acquired by the Science Museum Group and unveiled at The Museum of Science and Industry in March. Photography by Jennie Hills for the Science Museum Group

OUR CELEBRATION OF SCIENCE AND ENGINEERING

The vision of the Science Museum Group is of a society that celebrates science, technology and engineering and their impact on our lives, now and in the future, says Mary Archer, chairman of the Group

For me, one of the enduring pleasures of walking round any of the Group’s five museums is to see the impact our collections have on our visitors. From the unbridled enthusiasm of the 445,000 children who came with their teachers in booked school groups this year, to the quiet appreciation of visitors to our First World War exhibition, *Wounded*, and the new audiences brought in by speakers such as mathematician Andrew Wiles and exhibitions such as *Illuminating India*, I see day by day how we are building science capital in individuals and society.

We are the most national of the nation’s museum groups, with four of our five museums in the North. When we welcomed the 2,500,000th visitor to the smallest of these – based in the country’s first railway town, Shildon, County Durham – it sent out a loud signal that it is full steam ahead for the Group.

Our milestone visitor in January of this year was Sean Richards, from Sedgefield, who came with his daughters Anna and Alex, and nephew Thomas. They were there to see Tim Peake’s Soyuz spacecraft which, with the support of Samsung, has been touring our five museums, and other sites across the country (by land not space) and inspiring the next generation of astronauts.

Our Shildon museum – born in 2004 with the support of the Heritage Lottery Fund, Durham County Council and the European Regional Development Fund – officially became part of the Group last December, and we still enjoy a close working relationship with the council. It was kickstarted by a commitment from the council and our Board of Trustees to fund jointly long-overdue repair work to the historic buildings on this site.

Our medium-term plans for Locomotion will see even greater investment, but already it can draw on the Group-wide infrastructure rolled out in the past year, ranging from a new brand and look to new web and digital estate.

At our National Railway Museum in York, it has been good to see the first signs of the re-imagining of the Great Hall and the steady progress we and our partners are making with the York Central development; this will give us the space to showcase the current renaissance of the railways and future developments in the rail industry.

Dame Mary Archer inside this year’s *Manchester Science Festival* immersive experience, *Tape*

The annual science festival run by our Museum of Science and Industry in Manchester is now the most successful in the country, and here too we plan major capital improvements to the public realm surrounding our historic buildings, as well as the buildings themselves.

At our National Science and Media Museum, the new *Wonderlab* and rebrand have stimulated an uplift in visitor numbers. Partnership working has enriched the Bradford Science Festival, which we relaunched in summer 2017, and the museum’s outreach work has been a continued success.

None of this would be possible without financial support, not only from government through our much-valued and much-needed Grant in Aid, but from our many partners, patrons, supporters and visitors. We thank them all for their generosity and commitment. Finally, I note that we are looking at a substantial change in our Board of Trustees in 2019, and I am grateful to our current board for their hard work and commitment throughout another busy and successful year.

‘This is the best place we’ve filmed in two years. It’s a terrific museum’

Robert Peston, on the Museum of Science and Industry

‘If you are keen for the public to be guided by good sense, thoughtful analysis and informed opinion, you won't find a better place than the Science Museum’

Evan Davis, broadcaster

‘The Science Museum is a great national institution. The Royal Society and the museum have worked on some great projects this year, including the Tomorrow’s World webcast with Professor Brian Cox in conversation with Eric Schmidt from Google’

Sir Venki Ramakrishnan, President of Royal Society, Nobelist

‘For me, the Science Museum will always be the spiritual home of scientific celebration in the United Kingdom. A place where we can marvel at the great achievements of the past and inspire new generations for our future’

Dr Hannah Fry, mathematician and broadcaster

Part of a Hercules 264 radial engine made by the Bristol Aircraft Company in 1953, which is on loan from the RAF Museum

HIGHLIGHTS

Inside front cover: India in a special light
4 Our mission to inspire
Director Ian Blatchford on a trail-blazing year
6 The only place to be
8 Flocking to see Soyuz
12 The human side of robots
17 Partnerships pay off
24 A feast of festivals
26 Friendly faces of science
32 All the news that’s fit to fake
36 Illuminating India’s extraordinary history
46 Welcome to our volunteers
48 Research is our cornerstone
52 Superbugs – the common enemy
Inside back Terence Cuneo: the power of painting
Back cover: Full speed ahead

ON OTHER PAGES

16 Locomotion in motion
20 Why we look different
22 Our high flyers
23 The power of games
34 Tomorrow’s World – today and every day
38 A bigger home for our collections
40 What we’re restoring
42 Unexpected delights
44 Special events
53 Voyage into the unknown
54 What we acquired
55 What we lent out
64 Branching out from Britain

APPENDIX
Our five museums in profile

56 The financial challenges
58 Our ever-generous supporters
60 The trustees: who’s who
61 The Science Museum Group vision
62 The Science Museum, National Railway Museum and Museum of Science and Industry
63 National Science and Media Museum, Locomotion, Shildon, National Collections Centre, and Blythe House Collections Store

OUR MISSION IS TO INSPIRE THE WHOLE NATION

The spectacular success of the Soyuz national tour typifies what the Group is trying to achieve. This year we will be sending out Stephenson's Rocket to follow in the space capsule's trail-blazing path, says Group director Ian Blatchford

Last year I championed our international cultural and scientific diplomacy, and while that continues to flourish, now it is time to hail our work at home. In late 2017 the Government published a major appraisal of museums in England, the Mendoza Review. It acknowledged the considerable national and international profile of the national museums and their world-class collections, curatorial expertise and excellence in education. But one section gave me particular pleasure: in assessing how 'national' each of those great institutions was, it described the Science Museum Group as 'mostly outside London'. Such modest wording acknowledges our firm ambition to be active across the country. Indeed, perhaps we can claim to be the most national of the nationals?

The Group always seeks exciting ways to inspire audiences, and the spectacular success of the past 12 months must surely be the national tour of the Principia mission Soyuz capsule that brought Tim Peake back to Earth. The capsule and parachute first went on display at the Science Museum in January 2017 and amazed visitors from the off. I think there are two reasons for this: the alarmingly modest scale of something that ferries three people back to Earth and carries the brutal scars of 1,400C on entry in the Earth's atmosphere; and the galvanising UK-wide education programme run by the UK Space Agency during the Principia mission.

In September 2017 the Soyuz went on display at the National Science and Media Museum in Bradford, as the opening venue for a national tour that will embrace each museum in the Group, and the national museums in Edinburgh, Cardiff and Belfast. It is accompanied by a dynamic education programme, and a pioneering virtual reality experience in which visitors can imagine being inside the capsule. All of this has been possible due to an imaginative sponsorship by Samsung, a great partner for the Group. We both hoped for success, but reality has far exceeded expectations, with huge increases in audiences at each venue, and compelling evidence of first-time visitors as well.

Spurred on by stardom of Soyuz, we have also decided to tour the most iconic object in our collection. We hold for the nation more than 7 million things, but one object

'Spurred on by the stardom of Soyuz, we have also decided to tour the most iconic object in our collection – Stephenson's Rocket'

Ian Blatchford, SMG director

Ian Blatchford, Evelyn Nicola, senior CSR manager, Samsung, Tim Peake, Dr Gordon Rintoul, director, National Museums Scotland, at the Soyuz launch in Edinburgh

encapsulates British innovation more than any other: Stephenson's *Rocket*. It will be travelling to the Discovery Museum in Newcastle in June 2018, as a star player in the *Great Exhibition of the North*, and thence to museums in the Group, starting with Manchester in September. The Group also made a stylish contribution to Hull in 2017, under its mantle as UK City of Culture, opening a specially assembled and ground-breaking exhibition on the railway, war and industrial artist Terence Cuneo; with many prime pictures and posters drawn from holdings at the Science Museum and National Railway Museum.

The Government published its industrial strategy, in which science and engineering play pivotal roles. The Group will do all it can to support the showcasing – at home and abroad – of British invention and scientific leadership. But that strategy will also benefit from the vibrant and vital work we are *already* doing to encourage children and families to consider STEM careers and, incidentally, supporting the Year of Engineering 2018 (*see page 27*).

Regard for public institutions may be frayed these days, but our research suggests we are linked with national prosperity more than any other museum and visitors really trust us. That is why our career narratives are so compelling. Across the Group we were visited by over 497,000 children in educational groups, and we can claim to have more school visitors (445,000) than any museum in the UK and maybe in Europe too. Across the organisation we have been experimenting, pushing boundaries and encouraging the aspirations of young visitors, teachers and families. The *Future Engineers* programme at the National Railway Museum encourages young people to think about careers in railway engineering and the new digital technologies. In Manchester, the Museum of Science and Industry, built on the success of their brilliant annual science festival (now the most popular in England), to present *Digital Celebration*, an instant success as a type of careers fair about coding and computing. And at the National Science and Media Museum, the *Yorkshire Games Festival* is a creative way of inspiring young people.

The Science Museum Group is a serious national player in science, learning and culture. In 2017 we pushed ever harder to ensure that our resources and energy were shared across the country and that the ambitions of visitors moved in tandem with the employment and economic prospects for Britain. So it is also timely that in April 2017 I became the first Science Museum director to become of chairman of the National Museum Directors' Council, the influential body representing the major national, regional, military and university museums in the UK. As ever, this Group believes in leadership and impact.

WE ARE THE PLACE TO BE

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1 Lord Hall, director general of the BBC, launches *Tomorrow's World* in the Science Museum

2 Alan Gemmell, British Council country director for India; Sir Venki Ramakrishnan, president of the Royal Society; Yashvardhan Sinha, India's High Commissioner to the UK; Dame Mary Archer, chair of the Board of Trustees; Baroness Prasha; Dinesh K Patnaik, India's Deputy High Commissioner to the UK, and Group director, Ian Blatchford, at *Illuminating India* preview at the Science Museum

3 Poet Ben Okri, actress Rebecca Night and geneticist Steve Jones at *Voyages* event at the Science Museum

4 Astrophysicist and *Tomorrow's World* presenter Jennifer Gupta; Rami Tzabar of the BBC; author Angela Saini and *TW* presenter Alex Lathbridge at the Scientists Meet the Media Party, held with the Royal Society and ABSW, and sponsored by Wired UK and Johnson & Johnson Innovation

5 Broadcasters Ant Anstead, Len Goodman, Angela Rippon, David Harewood, Sir Trevor McDonald, Nick Knowles, Giles Coren and Angela Scanlon at the live broadcast of *Britain's Greatest Invention* at the National Collections Centre

6 Professor Ajit Lalvani, Tara Lalvani, Dr Kartar Lalvani and Tej Lalvani. at the Science Museum Annual Dinner

7 Actor and writer Tim Downie at *Illuminating India* preview at the Science Museum

8 Cosmonaut Valentina Tereshkova and Group director Ian Blatchford at the Science Museum for the opening of *Valentina Tereshkova: First Woman in Space*

9 HRH Princess Anne with Sally MacDonald, director of the Museum of Science and Industry

10 Professors Chris Rapley, John Zarnecki, Alan Smith and Ken Pounds at the press launch for *Skylark: Britain's Pioneering Space Rocket* at the Science Museum

11 Singer Katy Perry visits the *Robots* exhibition at the Science Museum

12 Brian Cox and Eric Schmidt in conversation for *Tomorrow's World Live: What's the Future of AI?* at the Science Museum

13 Parliamentary under secretary of state at the DCMS, Michael Ellis, visits the National Railway Museum to see Tim Peake's spacecraft with the museum director, Judith McNicol, and Group director, Ian Blatchford

14 Actor Simon Pegg visits *Power UP* at the Science Museum

15 Britain's first astronaut Helen Sharman in conversation, with her former chemistry teacher, Nobelist Sir Fraser Stoddart, at the annual dinner

16 Dame Margaret Weston, with her Fellowship at her Gloucestershire home

THE SOYUZ TOUR TAKES OFF

The public response to Tim Peake's spacecraft was overwhelming. Visitor numbers exploded at the four museums that hosted TMA-19M. But its terrestrial journey is not over yet

'The epitome of everything we aspire to,' said the Group deputy director, Jonathan Newby, after Tim Peake launched the Soyuz Tour in Bradford. 'Four museums, four unique settings but everywhere collaboration, inspiration and visitors in their droves.'

We were bowled over by the public response to the tour, which was made possible by the generous support from our presenting partner Samsung. More than 100,000 people came to see the spacecraft that took Britain's first ESA astronaut back from the International Space Station, an increase of 64% on the same period last year.

At Locomotion in Shildon the impact was still more startling; an increase in visitor numbers of 199%. And in every location our learning teams have risen to the challenge. In the whole of last year, a little over 9,000 children visited Locomotion in Shildon in school groups. In the eight weeks that Soyuz TMA-19M was on site school groups accounted for 2,397 visits.

Tim Peake said: 'I'm particularly happy that people up and down the UK now have the opportunity to discover more about my Principia mission and space travel, and that the Science Museum Group – with the support of Samsung – are doing so much to inspire the public and schools in this tour.'

At the National Railway Museum schools flocked to the arresting juxtaposition of the first flown, human rated spacecraft in our collection and some of the world's greatest locomotives.

In York more than 6,200 visitors opted to enhance their experience with Space Descent VR, a virtual reality experience using Samsung Gear VR technology, narrated by Tim Peake himself, that places visitors at the heart of his journey from the International Space Station back to Earth. Housed within a specially curated bespoke lounge, the VR experience has been popular at each site.

Next year, responding to Group director Ian Blatchford's clarion call to national museums – issued in *The Guardian* – to send their most iconic items out in the world, we will see the Soyuz tour heading to Scotland, Northern Ireland and Wales. But it was fitting that the climax of this year's tour was our final Science Museum Group location, the Museum of Science and Industry.

Below: Professor Danielle George MBE (left); the director of the Museum of Science and Industry, Sally MacDonald, and Sam Grant, chief marketing officer at Samsung Electronics UK at the launch of *Tim Peake's Spacecraft* in Manchester

It fell to director Sally MacDonald to reveal a fabulous late addition to the tour and the Science Museum Group's collection, the Sokol KV-2 emergency spacesuit worn by Tim on his six-hour journey to and from the space station with fellow astronauts.

'It's a massive privilege for the team here in Manchester to unveil the Sokol and to be able to show Tim's spacesuit and spacecraft together,' she said. 'It was fantastic to observe the sense of anticipation and excitement among both visitors and colleagues watching these important pieces of space history being prepared for tonight's launch event.'

Among an audience of 250 VIPs for the unveiling was Samsung's chief marketing officer, Sam Grant, who said this about the tour: 'The Science Museum Group shares our passion for igniting curiosity and this unique partnership has exceeded all of our expectations in bringing people closer to the inspiring technologies that make space travel possible. The unexpected addition of the Sokol suit to the tour really captures the spirit of our partnership.'

A further unexpected element of the tour was the winner of a competition to join the venues hosting the capsule. Two cathedrals made a shortlist of five that was considered by an expert panel chaired by Group director Ian Blatchford – but Peterborough Cathedral emerged victorious.

This exquisite place of worship will host the national tour between August and November 2018, coinciding with its 900th anniversary celebrations.

Blatchford said: 'It is rare to see the star objects in Britain's great museum collections touring the length and breadth of the country. It is even rarer to see a spacecraft in a cathedral. I am extremely pleased that thousands of people from all around the diocese of Peterborough will have the chance to see this extraordinary artefact of recent space history on their doorstep, and I cannot wait to see the Soyuz take the cathedral's 900th birthday celebrations out of this world when it arrives in August.'

Samsung and Soyuz
Up to seven schools near each site are visited by the Science Museum Group outreach team and the wonderful Space Descent with Tim Peake – The VR Experience Tour Bus (above), which is then followed by a visit to the host venue. The bus also parks up in the host city, allowing passers-by an opportunity to journey in space. More than 2,000 people at each of the locations have enjoyed this experience.

'It is rare to see the star objects in Britain's great museums touring the country. It is even rarer to see a spacecraft in a cathedral'

Ian Blatchford,
Science Museum Group director

Left: Visitors at Locomotion in Shildon during the last weekend hosting Tim Peake's spacecraft

Left: Dame Mary Archer, chair of the Board of Trustees for the Science Museum Group, inspects the Samsung spaceman suit-up experience on-board the tour bus

Right: Students at the launch of Soyuz at the National Railway Museum

Sokol - a lifesaving spacesuit
The Sokol suit worn by cosmonauts during launch to the International Space Station and the return to Earth was developed following the loss of three cosmonauts in 1971 who not wearing spacesuits when their craft depressurised on re-entry. Designed to prevent a repeat of that tragedy, the suit is made up of a rubberised internal bladder, which provides an airtight seal, and a rigid external coat to provide protection from mechanical and thermal impact. Every crew member has a made-to-measure suit. It's vital that it fits properly – each cosmonaut spends an hour in a launch seat with the suit inflated to make sure.

Once crew members are in the spacecraft, electrical and air supply lines and hoses are connected to the lower abdomen section. The Sokol suit can provide two hours of oxygen and carbon-dioxide removal if the cabin depressurises.

OUR ROBOTS ARE ON THE MARCH

The travelling Robots exhibition raises hundreds of questions about our relationships with automatons and tells us as much about humanity as it does about the robot world

'How fascinating to explore the incremental accumulation of human behaviour as it has been analysed, simulated and replicated by our robot relatives. Felt like I was keeping an eye on the opposition!'

Toby Jones, actor

Opposite page: Some of the visitors to the exhibition in London
Left: Pepper, an emotion-reading robot

That robots occupy a very special and sometimes frightening place in our imaginations can be in no doubt, particularly after the success of our *Robots* exhibition in London and Manchester.

Over 186,000 people saw the exhibition in London, and more than 66,000 in Manchester, making it the Museum of Science and Industry's most successful paid-for exhibition by a long way.

It may take a village to raise a child, but it takes an army to send an exhibition of this size out on a grand, five-year tour – more than 100 members of Science Museum Group staff have been involved, plus teams in Newcastle and Edinburgh, where the tour will continue to next.

Some might think that developing an exhibition of this scale has its glamorous moments – and certainly the inclusion of a 'rose engine' automaton lathe that, in the words of Science Museum Group director Ian Blatchford, is 'two and a half metres of pure bling that would look at home in President Trump's drawing room' is one –but for the curator of mechanical engineering, Ben Russell, one of the defining memories will be of dragging the Shadow Biped out from under a pile of rubbish by its ankles.

Russell said: 'Shadow is the most amazing company based in Islington, they're world leaders in creating robotic hands. At the end of one meeting with them they said, "we've got a human in the basement, would you like to see it?" We went down to this gaping chasm in the building's foundations, a real dumping ground, and after digging around I saw a pair of feet sticking out from underneath a pile of rubbish and collapsed plaster. We had to go back with breathing apparatus and I pulled him out by his ankles. He's really remarkable – the first robot built outside Japan to be able to stand on two feet and take a step forward.'

Russell realised that the 'mangled' robot would need some serious tender loving care, and the story took a pleasingly apt London-Manchester turn when he called on the services of David Buckley, a robotics engineer based in Oldham (who had originally built the Shadow Biped). David painstakingly restored the robot to the superb state in which it can be seen in the exhibition.

Russell said: 'It was a wonderful find and really reinforced my belief that there was this stuff to be found out there. Objects like these tend to be cannibalised once they're built to create later versions, or they're left in basements or otherwise forgotten about as the industry moves on. Survival of significant stuff is not at all guaranteed.'

The exhibition raises hundreds of questions about human relationships with their mechanical avatars, which truly hold a mirror up to our hopes, dreams and fears. From the early days when automatons were used to perform 'miracles' by the Church, to our restless quest to create the 'perfect' humanoid robot, the exhibition is the story of obsession, curiosity, and ingenuity – and tells us as much about humanity as it does about the robot world.

The question of whether robots will steal human jobs was one that preoccupied many of the visiting news outlets, particularly after we had introduced them to Kodomoroid, the android newsreader. As well as garnering a host of adulatory reviews from the national and local press, the exhibition stimulated much debate on our digital platforms, with experts blogging for us about whether we should fear a 'Robopocalypse' and why future robots wouldn't be shaped like humans – despite it being a 500-year obsession for us.

‘He’s really remarkable – the first robot built outside Japan to be able to stand on two feet and take a step forward’

Ben Russell,
curator of mechanical engineering

One robot with a full-time job is Pepper, SoftBank Robotics’ adorable humanoid creation that fistbumps visitors and tells stories to delight all ages. Out in the wider world, Pepper’s siblings have held a variety of jobs, from performing Buddhist funeral rites to serving hungry customers at Pizza Hut. In Southend, Essex, Pepper’s ability to read emotions and provide assistance qualified it to join the borough council’s social care team. It will work in residential care homes and sheltered housing schemes to assist with rehabilitation exercises for those who have suffered strokes and help run reminiscence groups for people with dementia.

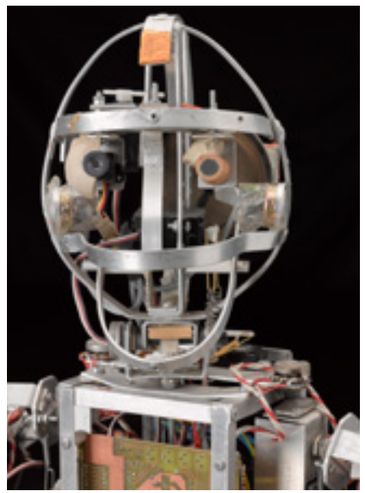
But despite Pepper’s cute face and linguistic abilities, it still lacks the human ability to think for itself. For that, and one of the best examples of the power of robots to ‘learn’ like humans, we have to turn to one of the smaller and less flashy robots in the build section of the exhibition – Steve Grand’s Lucy. Rather than simply being programmed, Lucy has a ‘brain’ built from tens of thousands of virtual neurons, and uses a digital camera to ‘see’ images which she then processes in a very similar way to a human.

‘Steve Grand is something of a maverick. He was thinking about consciousness and robots learning before it had occurred to a lot of people,’ said Ben Russell.

It took Lucy four years to learn to identify a banana, a feat that doesn’t seem so difficult to human brains, but, as Ben points out, the shape of a banana seen from one angle is very different when rotated, and once you take into account the possibility of changing size and colour, this ‘simple’ task for a human brain is actually very complex.

Lucy was ground breaking, but the fact that she can be outstripped in the classroom by a toddler suggests we are still a very long way away from some of the nightmare AI scenarios portrayed in science fiction.

AI, history and engineering can be complicated, so the team in Manchester took the Group’s ‘Open to All’ values to heart and set about creating a family trail that would make the exhibition more accessible for families with younger



Left: The exhibition included automated wonders such as the Silver Swan, dating back to the 18th century; Lucy is a robot built to mimic human learning; Robothespian was a huge draw and performed lines from Shakespeare and Casablanca

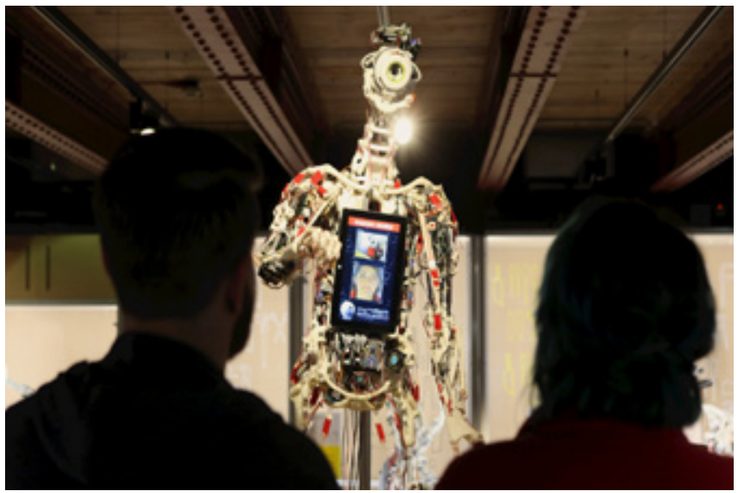
Right and below: ROSA – or Rob’s Open Source Android – was built to track human faces and to test how realistically robots could move
Below right: George was one of the UK’s first humanoid robots, and was built in 1949
Below left: is a robot newsreader who has appeared on Japanese television

children. Audience feedback shows that the trail has increased dwell times, given families a structured approach to the exhibition. The trail will accompany the tour to make sure even more people can enjoy the *Robots* experience.

The exhibition has led to a tour, book, videos and other digital assets and, for posterity, a new collection for the Science Museum Group, as part of the Heritage Lottery Fund’s Collecting Cultures project. The HLF has allowed the Group to start a new ‘Humanoid Robots’ collection, and as Ben Russell says: ‘We’ve got new acquisitions coming out of our ears.’

These include many of the objects featured in the exhibition, plus some that have not yet been seen, allowing the touring team to offer later venues objects owned by the Group to replace those for which it has not been possible to get extended loan agreements.

With three years left of the five-year tour, *Robots* is set to delight tens of thousands of more humans across the nation. And once the tour is over, some of these amazing automatons, Ben Russell’s ‘significant stuff’, will become part of the national collection, so their preservation is guaranteed.



LOCOMOTION GOING IN A FRESH DIRECTION

On 1 December 2017, Locomotion became a full part of the Science Museum Group – while continuing to benefit enormously from its 13-year partnership with Durham County Council, including generous financial support.

Locomotion provides visitors with the opportunity to see highlights of the national collection of railway vehicles in Shildon, County Durham, the world's first railway town.

Shildon has had an exciting story to tell – making it the perfect place to explore the rich seam of local railway history and discover how the railways transformed people's lives.

Locomotion also looks forward – as a key part of the local economy, a cultural asset, a focus for regeneration, and a place where the next generation of scientists and engineers can be inspired. Linking into Locomotion's recent integration into the Science Museum Group, the museum has benefited from stunning visual rebranding across the site.

A great example of Locomotion's integration into the Group was the work to bring *Tim Peake's Spacecraft* to Shildon from November 2017 to January 2018 as part of the national tour, supported by Samsung (*see pages 8-11*).

This display brought together science, technology and engineering – inspiring visitors from Shildon, and across the North East of England.

In September 2017, Locomotion hosted another engineering icon from the Science Museum Group collection – *Flying Scotsman* – to thrill the crowds at the museum's annual autumn steam gala, which attracted more than 7,500 visitors.

From January 2018 to March 2018, Locomotion was also the venue for *Rail Cameramen*, an exhibition by the prestigious Rail Camera Club to celebrate its 100th folio. This exhibition has generated glowing reviews in the railway press.

The conservation workshop is also continuing to work on a range of high-profile historic railway vehicles. The key project for this year is the restoration of the electric 2-car 2HAP No. 4308. This once-familiar unit travelled more than 2.7 million miles – equivalent to the Moon and back five times – during its 30-plus years on Britain's tracks.

Locomotion has exciting plans for the future, including the restoration of its historic buildings, promotion of our incredible national collection vehicles, and building on relationships with the local community and neighbours in the cultural sector.

Above: Ian Matthews working on the cosmetic restoration of 2HAP Unit No. 4308 in the conservation workshop at Locomotion – watched by delegates from the 18th Annual Carriage Restorers' Convention

Bottom: J21 No. 65033 on display outside Locomotion's Collection Building – with our new signage on show

OUR MISSION TO INSPIRE IS EXPANDING FAST

Whether it's promoting engineering or science festivals, sharing ideas to make the world a better place, or throwing new light on India, we have forged new partnerships with funders

'We are proud to partner with the Science Museum Group as we share a strong belief that instilling a sense of curiosity lies at the heart of life-long learning'

Sam Grant, chief marketing officer, Samsung

Above: Titan the Robot entertained tens of thousands of people in City Park over the weekend of the Bradford Science Festival

When we asked 1,000 adults what they thought of the Science Museum brand and our role in inspiring the next generation of scientists and engineers, the results were unequivocal: our museums play a pre-eminent role because they are most associated with values such as 'forward looking' and 'inspiring.'

The survey also showed that partnerships have an important role to play in supporting our mission to contribute to the science, technology, engineering and mathematics (STEM) skills agenda and we believe they will be crucial to delivering transformational change in the Group.

We are a global organisation with remarkable convening power. In September, industry, academia and seven government ministers came together at the Science Museum to launch a new government-led initiative: the Year of Engineering 2018. With the generous support of the leading engineering company Bechtel and the Department for Business, Energy and Industrial Strategy, we are launching a learning programme across the Group to promote positive perceptions of engineering and inspire the innovators and problem solvers of the future. Bechtel's support also allowed us to extend the run of our inspiring *Engineer Your Future* gallery at the Science Museum.

Festivals across the Group are helping us deepen public engagement with STEM learning outside our museums.

Our major exhibition *Robots*, now on tour, was generously supported in Manchester by EPSRC BEST, MTA and the Hobson Charity, and opened there as the headline attraction of this year's *Manchester Science Festival,* which was supported by the University of Salford Manchester, Waters, and Electricity North West.

The National Science and Media Museum continues to deliver a strong and varied festival programme that explores the themes of film, gaming and science. *Widescreen Weekend* was supported by the International Moving Image Society and the City of Bradford Metropolitan District Council. The *Yorkshire Games Festival* returned for a second year thanks to the support of key local stakeholders Bradford College and the City of Bradford Metropolitan District Council, and the *Bradford Science Festival*, which was supported by The Broadway Bradford, saw learning activities take place across the city.

After the success at the Science Museum of last year's *Future Engineers*, the festival returned for its second year to the National Railway Museum, with an extended two-week run over the October half term. Over 42,000 visitors took part in the exciting range of activities, none of which would have been possible without the continued and generous support of Angel Trains, Eversholt Rail Group and Porterbrook.

By deepening our relationships with key funders, we have reached out to new audiences across the country. Our extended partnership with Samsung, as presenting partner of the *National Tour of Tim Peake's Spacecraft*, demonstrates how we create innovative partnerships inspired by shared ambitions. Using Soyuz as an example of human endeavour and innovation, Samsung and the Group are taking this object on a tour of the UK, working together to harness the power of technology, creating immersive experiences which bring people closer to the science behind space and spark life-long curiosity.

In the autumn Statoil, with the Science Museum's support, launched *Young Imagineers*, a nationwide competition inviting young people to share ideas for an invention to make tomorrow's world a better place. In line with *Wonderlab: The Statoil Gallery*'s core values, the competition was designed to build upon children's natural curiosity to ensure long-lasting engagement with STEM subjects.

In London, the *Illuminating India* season saw us partner two new funders, the Bagri Foundation and the Helen Hamlyn Trust, and continue our relationship with the John S Cohen Foundation. The two exhibitions were augmented by an extraordinary series of events, including film screenings, workshops, panel discussions and live performances.

Thanks to our dynamic public programme we are appealing to more visitors and nowhere has this been seen more than at the National Science and Media Museum. Following the launch of the museum's new brand, the opening of the *Wonderlab* gallery, the arrival of Soyuz and this year's exciting programme of exhibitions, the museum is having a hugely successful year in terms of visitor numbers, which has led to record-breaking donations. The impact of the public programme on visitor numbers and their generosity has been clear across the Group. Tim Peake's Soyuz capsule attracted visitors from far afield as it toured the museums and the support of these visitors was integral to helping raise over £2.9 million in visitor donations for the Group this year.

British director Christopher Nolan's acclaimed Dunkirk delighted the opening-night audience at the National Science and Media Museum's *Widescreen Weekend*, shown from 70mm film of course.

Above: engrossed at the Yorkshire Games Festival
Right: Rajasthani folk dancing at the Science Museum
Below right: Lord Jim O'Neill, curator Sheldon Paquin, Erik Nordkamp, presenter Angela Rippon and Group director Ian Blatchford at the *Superbugs: The Fight For Our Lives* opening

'I owe my life to antibiotics because as a child I contracted TB. Antibiotics have saved millions of lives. They are a modern medical miracle'

Angela Rippon, presenter

Our contemporary science programme continues to tackle pressing issues, as we opened *Superbugs: The Fight For Our Lives* at the Science Museum in November, at a time when increasing awareness of antimicrobial resistance is more urgent than ever. The exhibition allowed us to consolidate our important relationship with the UK's Research Councils, through UK Research and Innovation, as well as develop new partnerships with Pfizer, Shionogi and the University of East Anglia.

Left: A student enjoying the Samsung astronaut selfie suit at the launch of *Tim Peake's Spacecraft* at the National Railway Museum
Below: Students onboard the Samsung Space Descent with Tim Peake – The VR Experience Tour Bus at the launch in Locomotion, Shildon

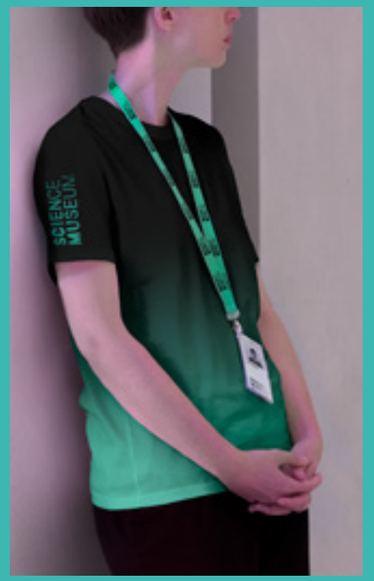
Building on the successful Enterprising Science 5-year academic partnership with BP and UCL, and thanks to continued funding from BP, we will launch the Science Museum's Academy, which will specialise in science engagement from September 2018. The academy will put the Enterprising Science 'science capital' research into practice, at scale, by delivering outstanding training and resources to teachers, museum educators and STEM professionals, from engagement hubs in London and Manchester, and through online resources.

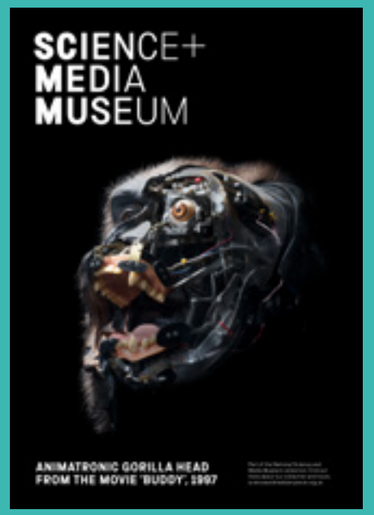
Masterplans are underway in York, Manchester, and Bradford, all of which are in the midst of major urban regeneration schemes in which we are lead players. Our plans are ambitious and will set us on a new trajectory, not only in terms of collections interpretation and visitor experience, but also in our role as a vital cultural and economic partner within those cities.

Across the Group, we have an exciting public programme, transformational plans for new galleries, an ambition to extend the reach and impact of our informal STEM learning initiatives and more. We look forward to developing relationships with partners and funders who share our vision and with whom we can work to make it a reality.

WE'RE LOOKING DIFFERENT

Our brand identity – uniforms, signs, logos, fonts and online address – has changed. For a very good reason





A stunning new visual identity, from logos to uniforms, product design and fonts, has been rolled out across four of our Group's five museums over the past year, with the Museum of Science and Industry to follow in the autumn.

Usually accompanied by a landing of Tim Peake's Soyuz capsule and a surge in visitors, the arrival of the new brand at each site celebrates our shared values as the world's leading group of science museums, just as the tour of the Soyuz spacecraft celebrates our decision to treat the millions of items we hold as a single collection.

The visual identity was developed by the award-winning design company North, which also helped us to articulate our shared purpose, through a new brand mission to inspire futures, with the aim of igniting curiosity among people of all ages and backgrounds.

Our new brand mission inspired the idea of illumination as a central feature of the new identity, explored through the gradated font weight in the new logos, the use of vibrant colour gradients within the graphic language and even the name of a new commercial venue in the Science Museum.

'North have created a confident and elegant visual identity', says Group deputy director Jonathan Newby, 'that proudly projects our unity yet allows each museum to continue to express its specific focus'.

'Just as the museums explore the ingenuity behind scientific advance,' adds Sean Perkins, founding partner of North, 'so we set out to create a brand that was both beautiful and innovative.'

The new brand was first deployed in Bradford as part of the relaunch of the National Science and Media Museum, while its adoption at Locomotion marked that museum becoming a full part of the Science Museum Group, albeit with Durham County Council remaining our key partner.

Striking new imagery was commissioned from photographer Lee Mawdsley to celebrate the intricate beauty of objects within our collection and leading web agency Numiko developed our new online ecosystem for our Group that adopts the new identity and introduces a common architecture to help visitors make the most of their museum visit and explore our astonishingly diverse collection.

A single website for our shared collection (collection.sciencemuseum.org.uk) now provides intuitive access to over 250,000 records from our object and archive collections, and our ambitious digitisation programme is enhancing, improving and adding hundreds of thousands of new records to the website.

Teachers can also now access a growing suite of digital resources to accompany the visits by 650,000 schoolchildren each year to our museums. These resources will also support activity away from our museums – in line with one of the foundations of the Government's industrial strategy – to ignite young people's curiosity in science, mathematics technology and engineering. (*see page 26*).

'Just as the museums explore the ingenuity behind scientific advance, so we set out to create a brand that was both beautiful and innovative'

Sean Perkins, founding partner of North

Right: The newly rebranded City entrance to the National Railway Museum in York – unveiled in April

Above: *Wonderlab*
Left: the new look of the National Science and Media Museum
Below: Locomotion rebranded

Far left: A sharper look for Group T-shirts, posters and the website

Far left bottom: This Animatronic gorilla head created by Jim Henson's Creature Shop for the film Buddy featured in the NSMM campaign launching its new brand identity

'I have a fabulous job – inspiring future engineers and telling the stories of how railways changed the world'

Judith McNicol, director, National Railway Museum

LEADING LIGHTS

Judith McNicol was this year appointed director of the National Railway Museum, the first woman to lead the museum in its 45-year history.

Judith has been based in York since she joined the Science Museum Group in 2005 – her first week in the museum was unforgettable, as she was allowed to ride on the footplate of *Flying Scotsman* – 'a magical experience'.

She is passionate about creating opportunities for young people to pursue careers in engineering and technology, especially girls, in line with the Group's ambition to remain a gender-balanced organisation, from top to bottom.

At the annual dinner, the Group bestowed a fellowship on Dame Margaret Weston, who in 1973 became the first female director of a national museum and the main architect of the Group today.

On her first day as director, Dame Margaret was in York, announcing the city as the home of the National Railway Museum, which opened in 1975. In 1983, she opened the National Science and Media Museum in Bradford (known then as the National Museum of Photography, Film and Television), where Jo Quinton-Tulloch is now director.

Before Dame Margaret stepped down as director in 1986, the Group acquired a former airfield at Wroughton, near Swindon, in 1979 to allow the development of collections of larger objects such as planes and submarines, now known as the National Collections Centre (*see page 38*). In 2012, the Group was joined by the Museum of Science and Industry in Manchester, where today Sally MacDonald is director.

The past year also saw Dame Mary Archer reappointed as the chair of the Board of Trustees by the Prime Minister and Susan Raikes appointed the Group's director of learning.

Overall, more than 60% of the Group's employees are women; its executive consists of nine women and four men, and more than half of all middle and senior management roles (those earning over £50,000) in the Group are held by women.

Clockwise from top: Judith McNicol, director of the National Railway Museum, aboard a Samsung VR bus. Susan Raikes, the Group's director of learning. Dame Mary Archer with Dame Margaret Weston. Sally MacDonald, director of the Museum of Science and Industry. Jo Quinton-Tulloch, director of the National Science and Media Museum

'There is something to excite everyone at Power UP – from gaming enthusiasts to retro fans'

Michelle Lockhart, SMG commercial director

ULTIMATE GAMING EXPERIENCE

Whether Pong or Pacman, retro-gaming continues to play well with all ages

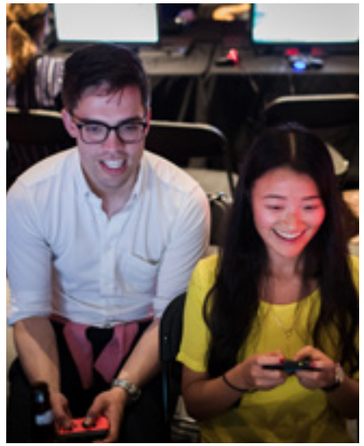
Power UP, a 40-year journey through interactive gaming, proved as popular as ever in 2017 when we welcomed back the event to the Museum of Science and Industry in August and the Science Museum in October.

Power UP is a hands-on, fully interactive gaming event that featured the very best video games and consoles from the past 40 years. From Pong to Pacman and Minecraft to Mario, there is a video game for all, whether visitors were retro games fans, VR aficionados or just keen to rediscover childhood favourites.

At the Museum of Science and Industry *Power UP* proved enduringly popular, while the event was almost sold out and enjoyed two sold-out evening slots during the run at the Science Museum. On the opening morning the Science Museum hosted a live broadcast on *BBC Breakfast* and was also visited by gaming YouTube star Stampy Cat.

To support the learning element of *Power UP* the Science Museum ran *Game On*, an interactive workshop designed to teach children how to create their very own gaming controller. The Science Museum also held a popular *Power UP* themed adult-only Lates.

Michelle Lockhart, Science Museum Group commercial director, said: 'In 2017 we were delighted to be able to bring back *Power UP* to the Science Museum and Museum of Science and Industry following a hugely successful run at both museums in 2016. The allure of video games really is universal and that's reflected in our offering to visitors. There is something to excite and inspire everyone at *Power UP* – from gaming enthusiasts and retro fans who want to relive the classics, to parents looking to share the games that defined their childhood with their own kids.'



Right: Hands on and fully interactive, *Power UP* featured games and workshops from the past four decades

RETURN TO CONTENTS PAGE

‘A SPECTACULAR CELEBRATION’ IN MANCHESTER

‘People of all ages tried everything from crafting to coding’

Antonio Benitez, festival director

The *Manchester Science Festival*, the biggest of its kind in England, welcomed more than 130,000 visitors in 2017 and helped to boost numbers by one quarter at the Museum of Science and Industry compared with 2016.

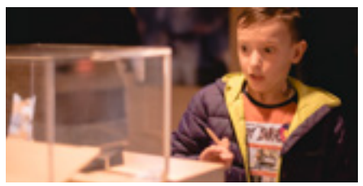
From a library of fake news to an exploration of the human voice, the museum produced more than 100 events at 50 venues across Greater Manchester for the festival, sponsored by the University of Salford, Electricity North West and the analytical science company Waters.

Headlining the festival in October was *Robots*, an exhibition exploring humanity’s 500-year quest to recreate ourselves in mechanised form, also the focus of an accompanying *Tomorrow’s World* webcast by the BBC (*see page 34*).

Among other highlights were *Tape*, a structure inspired by spiders’ webs and created by award-winning artists Numen/For Use using 330 rolls of sticky tape; a preview of the world’s biggest sleep study, and discussion among reproductive science experts on issues as diverse as ‘three-parent babies’ and gene editing.

Every year, *MakeFest* welcomes tinkerers, coders and artists from all over the North West and beyond to the museum, to get visitors involved in tech, engineering, craft and creativity. Antonio Benitez, who leads both the *Manchester Science Festival* and *MakeFest*, called it a ‘two-day spectacular celebration of making where people of all ages tried everything from crafting to coding’.

Among this year’s highlights was a recycled robots battle ring, building light-up cuddly toys with Manchester Girl Guides, programming the first stored program computer, Baby, with volunteers; and vintage toy nostalgia with the North-West Meccano Guild.



Above left, clockwise: The immersive *Tape* experience created a giant spiderweb in the 1830 Warehouse; Adam Rutherford, Dallas Campbell and Prof Danielle George talking Robots at the Museum of Science and Industry; rapper Jon Chase, winner of the Josh Award for Science Communication; a young visitor enjoying the *Robots* exhibition

BRADFORD: THE BIG PICTURE

Last October, the National Science and Media Museum held *Widescreen Weekend*, a unique festival of large-screen formats and cinema technologies celebrating the past, present and future of film. It took advantage of the Bradford museum’s unrivalled projection facilities, notably for Cinerama, which was developed to help movies compete with the new mass medium of television in the 1950s

It is one of only three theatres in the world that can screen the first form of Cinerama, which requires three projectors running simultaneously, each aimed at a different part of an enormous triptych-style screen. Film historian and author Sir Christopher Frayling curated the guests, Cinerama restorations and 70mm screenings, including a new print of David Lean’s epic *Lawrence of Arabia* (1962).

Among the guests were: filmmaker Gregory Orr, whose grandfather – Jack L Warner – was president of Warner Brothers studios; film historian, documentary maker, filmmaker, and author Kevin Brownlow, who described his incredible 50-year quest to restore Abel Gance’s five-and-a-half-hour silent masterpiece *Napoléon* (1927); and award-winning costume designer Jane Petrie, who discussed working on titles including *Star Wars: The Phantom Menace*, *Moon* and Charlie Brooker’s *Black Mirror*.

The museum hosted the second *Yorkshire Games Festival*, which kicked off with a special day for schools, followed by two days of inspiring talks by leading lights of the industry: Dominic Matthews of Ninja Theory, Louise McLennan and Sebastian Hickey of Frontier Developments, Oli De-Vine and Phil Duncan of Ghost Town Games, Tracy Spaight of Wargaming.net and Kieran Crimmins and James Svensson of Criterion Games. Award-winning visual effects artist (and Bradford College alumnus) Iki Ikram, who is director at Beyond-FX, said: ‘I’m hugely grateful for all the work the National Science and Media Museum team did to make the festival happen and to make it the success that is was. I see it growing more and more each year.’

And 2017 saw the launch of a new format for the *Bradford Science Festival*, with the museum taking the helm for the first time. The family-focused event brought wet and wild experiments to City Park, making full use of the UK’s largest urban water feature; STEM activities throughout the museum, including a forensic crime scene investigation; and an archaeological dig at the Broadway shopping centre.

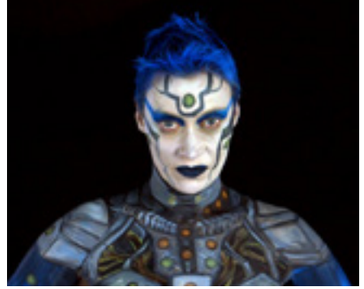
Over two-and-a-half days in July robots of all shapes and sizes, roaming dinosaurs and erupting volcanoes brought nearly 35,000 people to the city centre.

Above: Face to face with Titan the Robot in Bradford’s City Park

Below: Family enjoying a robotics display at the Bradford Science Festival

LONDON HORROR STORY

In London, to mark the 200th anniversary of Mary Shelley’s *Frankenstein*, a festival of immersive theatre, hands-on activities and experimental storytelling was organised to explore the ethical, scientific and technical questions surrounding whether to create life. Among the highlights were *Humanity 2.0*, a futuristic play by Emily Carding, and *Pandemic*, a choose-your-own-adventure film starring Jenny Agutter, who said: ‘I loved being out of my *Call the Midwife* habit, to play a somewhat dubious character in the *Pandemic* interactive film. I hope I didn’t persuade too many people to go along with my questionable values.’



‘This direct interaction between young people and the Soyuz space capsule helps us change perceptions about engineering, which is what the year is all about’

Stephen Metcalfe MP, government envoy for the Year of Engineering, on the Soyuz tour

BUILDING OUR FUTURE WITH FUN, FACTS AND FRIENDLY FACES

Our explainers are in the front line, helping to inspire a new generation of scientists and engineers

When the Government announced that 2018 was to be designated the Year of Engineering, no fewer than seven ministers from across government turned up for the glittering launch at the Science Museum, along with a galaxy of engineering stars.

The event, introduced by the Science Museum Group chair, Dame Mary Archer, made it clear that the Government is committed to promoting engineering achievements and careers as part of its industrial strategy.

But the stellar event also underlined the importance of the Learning department. Galvanised by our new shared mission and values, the Science Museum Group is the UK’s top informal learning organisation in the push to tackle the science, technology, engineering and maths (STEM) skills gap by building science capital – increasing engagement with science – across diverse audiences in our five museums.

Future Engineers, our engineering programme for young people at the National Railway Museum in York, had over 43,000 visitors, with people able to talk directly to professional engineers about the skills needed to enable them to become engineers and build and maintain vital infrastructure. What’s more, a quarter of the engineers were women – double the national average – as we appreciate the importance of providing more identifiable role models and breaking the stereotypes that have acted as barriers to recruitment.

Over the last five years, we have also been working with BP, King’s College London and University College London on the pioneering Enterprising Science project. This important initiative has allowed us to deliver valuable STEM experiences to a wide range of participants, while developing our understanding of how people relate to science and technology and how it can be made an effective part of their informal education.

Left: Explainer Lizzie Nolan making technology fun for family visitors at the National Science and Media Museum **Above:** The ‘Gurgle Splosher’ demonstrating the properties of water

LATES BUILD ON EARLY STRENGTHS

Our Lates have once again been extremely popular and very effective at engaging educators

Lates events across the Group have gone from strength to strength. Inviting young adults into our museums after hours and delivering specially programmed entertaining and inspiring events, talks, workshops and performances has diversified the Learning team's work at the Science Museum in London. This approach has been developed across the Group, with the National Science and Media Museum leading the charge.

The Space Lates, organised to complement the arrival of *Tim Peake's Spacecraft* and Space Descent VR on the first stop of a two-year national tour, saw 720 people trying out new technology, hearing from curators about our objects and creating souvenirs, making the science of space and space travel a memorable part of their night's visit. In London, Space Lates attracted 4,913 visitors.

The tour of Tim Peake's spacecraft, delivered in partnership with global technology innovators Samsung, has been a huge source of inspiration for one of the Learning department's valuable teams, the Explainers. As the spacecraft has made its way around the Group museums, our Explainers have been talking to visitors about life aboard the International Space Station, about Tim Peake's Principia mission – which captured the imagination of the nation in 2015/16 – and about the stark realities of a high-speed journey aboard a Soyuz descent module, one of the most robust and practical vehicles ever designed. Using information developed with the UK and European Space Agencies and small-scale 3D printed versions of the Soyuz rocket, Explainers have inspired a wide range of visitors, including hundreds of school groups.

Bradford Forster Academy, in particular, were lucky to take part in a special Q&A session at the National Science and Media Museum in September with the UK's first European Space Agency astronaut.

Our three-year outreach project for schools, run in collaboration with Google, came to an end this year. Having commenced at the Science Museum in 2014, reaching 605 participants, the project expanded to cover four of the Group sites, working with over 15,000 participants.

Bradford Science Festival
In July, the *Bradford Science Festival* took over the city for three days of fun, experiments and exploration. Across a range of interactive zones, the festival explored the science of space, robotics and sound, with the Gurgle Splosher sound installation in the City Square's Mirror Pool linking back to the National Science and Media Museum's successful summer exhibition *Supersenses*. The National Science and Media Museum continued to increase its support for learning initiatives with local schools and families by co-hosting a *Bedtime Stories* event to promote early years reading skills. We reached more than 3,500 parents and children from areas of high and complex deprivation in Bradford.

Digital Celebration
The Museum of Science and Industry hosted the *Digital Celebration* in January, allowing young people to eye up the vast and varied potential of a career in the digital sector, with digital skills and design engineering workshops run by our respected partner organisations, including UK Fast, Code Club and Hive Manchester. 'It's really pleasing to create something you have a vision of and then be able to see it in real life applications,' said one pupil.

Top left: a space-themed Late workship and no hands DJs
Left: Visitors making microbe accessories at a *Superbugs* themed Lates

Top: Noisy toys Base buzz Google Festival
Left: STEM Ambassadors from Dock 10 helping students at the Digital Celebration event
Above: VR drone flying with Sky Captain at BDSF17

WONDERLAB IS RE-ENGINEERED

Learning about space travel and careers in engineering are two aspects of our work at our museums and in outreach, but the opportunities we offer to inspire the youngest minds to think like scientists – harnessing their curiosity, close attention and creativity – are the best place to start to build a life with science at its heart. Understanding the huge impact that hands-on, informal learning can have means that our *Wonderlabs* have been a focus of our attention in 2017–18.

After 18 months of operation of *Wonderlab: The Statoil Gallery* in London and a year of *Wonderlab* at the National Science and Media Museum, Bradford, we have just announced our intention to create a uniquely engineering-focused *Wonderlab* (complete with its own tinkering space) as part of the ambitious masterplan at the National Railway Museum. Our explainers have been delivering new shows in London and Bradford (including complementary fun ones exploring maths and engineering), as well as five new talks for *Science on a Sphere*, an innovative way to visualise data.

‘Wonderlab lets teachers do what can’t be done in the classroom. This is learning by stealth’

Vicky Clifton, head of learning at the National Science and Media Museum

The regular development of new offers for *Wonderlab* has seen local repeat visitors increase hugely at Bradford, demonstrating the appeal of informal learning experiences.

The past year has been a fantastic testament to the work of Explainers and our team as a whole, ensuring that, across the Science Museum Group, we’re consistently building science capital in inspiring ways:

Academy of Science
One exciting development announced at the end of the financial year was the creation of the Science Museum Group Academy of science engagement, supported by founding partner BP.

To be launched formally in September 2018, the Academy, which will have a permanent physical presence in our museums in London and Manchester, will give us the opportunity to establish the Group as a centre for international excellence in building science capital by delivering outstanding training and resources for teachers, museum educators and STEM professionals. Working with our founding partner BP, we will be able to give future engineers and scientists an unparalleled introduction to science.

‘The networking event increased my enthusiasm for promoting STEM; it was really interesting finding out what everybody does’

STEM Ambassador

Far left: Exploring reflections in the *Wonderlab* Infinity Boxes

Left: Experiencing chemistry close up at the *Wonderlab* Chemistry Bar, with its daily chemistry and bubble science demonstrations

Below: Brownies take part in workshops during the first sleepover at the Museum of Science and Industry

Exporting interactive space to Australia
Our expertise in interactive gallery development is being recognised internationally, with Queensland Museum working with our Touring and Consultancy team to create a new interactive space there.

Never too young to experiment
Similarly, our *Experitots* sessions at the Museum of Science and Industry have proved very popular – a great chance for our youngest visitors to play and experience multi-sensory exploration in our hands-on gallery *Experiment!*

STEM ambassadors
Our museums aren’t just a source of inspiration for our youngest visitors, as witnessed by the success of our STEM professional networking sessions. We are delighted to work with STEM Learning to deliver the STEM Ambassador programme in the Trans-Pennine region. Teachers and STEM leaders came together for the Museum of Science and Industry’s STEM Networking Live: Year of Engineering event, with the STEM Ambassadors co-ordinated by the Group featuring prominently.

Brownie points for Manchester
The first sleepover at the Museum of Science and Industry took place in January with groups of excited Brownies taking over the museum for a night of fun and learning. The team is looking to replicate this success next year.

RETURN TO CONTENTS PAGE

FAKE NEWS – SO WHAT'S NEW?

Recognising that museums are more important than ever in providing facts in a 'post-truth' world, the National Science and Media Museum in Bradford rose to the challenge

During the year that the term 'fake news' was added into the Collins dictionary, it became clear that the public would rely on our museums more than ever for accurate information.

In response, we organised high-profile events across our Group to discuss the rise of the 'post-truth era', whether it marked something truly new, and what it meant for science.

'Fake news' became the starting point for an exhibition at the National Science and Media Museum in Bradford, running from 24 November 2017 to 28 January 2018, using the Group's collections and archives alongside contemporary news and social media outlets. It also adopted a new 'hot topic' format with sufficient salience and power to tour other museums.

John O'Shea, senior exhibitions manager, said: 'Key from our perspective was a sense of urgency, and we wanted to go live with the exhibition during 2017, while understanding of the "fake news" phenomenon was still in flux.'

The exhibition examined some of the world's most famous hoaxes, from 1835 reports that astronomer Sir John Herschel had discovered 'bat people' were living on the Moon to the evidence of the 'Cottingley Fairies' lurking at the end of a garden, captured on film by two girls in 1917.

Contested crowd attendance figures at Donald Trump's presidential inauguration and Jeremy Corbyn's supposed royal snub at the 2017 State Opening of Parliament were among the contemporary issues to come under the lens of the exhibition.

Far left: This 1933 image from the Daily Herald picture library featured in the Fake News exhibition as an example of photo-manipulation. The police officer has been cut out and moved towards the centre of the frame

'I was so impressed by the intelligent, thought-provoking focus of the Fake News exhibition at Bradford and the speed with which it was put together. With a live discussion that involved local and national experts talking directly with visitors who cared passionately about world events'

Samira Ahmed, Broadcaster

'We worked "journalistically", scoping, evaluating and changing content priorities right up until launch,' said O'Shea.

The exhibition was reviewed favourably in the national press, including the *Independent*, *Daily Telegraph*, *Guardian Guide* (Pick of the Week) and BBC Radio 4's *The World this Weekend*. In a strange turn, the exhibition was also referenced by the Twitter account of the Russian Embassy.

The museum also staged a special event on post-truth reporting with award-winning broadcaster Samira Ahmed; Natalie Kane, curator of digital design at the V&A; John Lubbock, communications coordinator at Wikimedia UK; and representatives from the University of Bradford's Division of Peace Studies.

Samira Ahmed, who is also an adviser to the Bradford museum, featured at a Museums Association event, *Trump Facts* in Manchester, chaired by the director of the Museum of Science and Industry, Sally MacDonald, and featuring the Group director, Ian Blatchford, and Group trustee and journalist Matthew d'Ancona, author of *Post-Truth: The New War on Truth and How to Fight Back*.

D'Ancona also appeared at the Science Museum in his first public event with the authors of two other critically acclaimed books on the rise of the 'post-truth era': James Ball, special correspondent for BuzzFeed UK, author of *Post-Truth: How Bullshit Conquered the World*; and Evan Davis, BBC presenter, *Newsnight* anchor and author of *Post-Truth: Why We Have Reached Peak Bullshit*.

Chaired by Fiona Fox of the Science Media Centre, the event focused on the implications for science. Ball argued that post-truth is, in reality, 'a collection of old problems, weaponised by the internet.'

When it comes to scientists, Davis pointed out they are all too human; they make mistakes; there are replication issues and confirmation biases; and there are those 'facts' that turn out to be wrong or more complicated than thought. His tactical advice to them was to 'apply a bit of psychology' and not to be hectoring, or rely on spin, but 'be more modest about what they know', to express more doubt and to be less dogmatic.

In introducing the IMAX event, Ian Blatchford, Group director, stressed the need to find the right way to engage with a broad audience: 'It isn't dumbing down, it is finding the narrative to discuss complex science with everyone.'

Above: Fiona Fox, Director of the Science Media Centre; Evan Davis, BBC presenter; Matthew d'Ancona, columnist, Science Museum Group Trustee; and James Ball, Special Correspondent for BuzzFeed UK
Below left: Sample of some of the more lurid fake news headlines
Below: The Fake News promotional poster depicting Donald Trump's presidential inauguration ceremony

TOMORROW'S WORLD TODAY – AND EVERY DAY

A new collaboration with the BBC has enabled us to attract hundreds of thousands more visitors online

Above: Jen Gupta, Hannah Critchlow, Libby Jackson UKSA; Prof Monica Grady, OU; Dr Hannah Fry, UCL; Kevin Fong, Dr Ellie Cosgrave and Dr Beth Healey

Above: The panel of *Tomorrow's World Live*: Me and My Robot, Dr Sabine Hauert, Dr Simon Watson, Prof Andy Miah and Dr Louise Dennis with presenter Jen Gupta
Right: Could quantum computers change the world? Scientists from Ion Quantum Technology Group, (University of Sussex) demonstrate how scientists manipulate atoms

Take four great institutions, including our Group of five museums, and add the incredible reach of the BBC. What you get is *Tomorrow's World*, a digital reboot of a much-loved format that has helped us engage with hundreds of thousands more people in the past year.

The *Tomorrow's World* partnership dates from 2015 when Lord Hall, the BBC's director-general, made a speech at the Science Museum outlining an ambition to create 'a BBC that is truly open to partnership – working much closer with others for the good of the nation'.

On 2 May 2017, the Science Museum hosted the launch of the *Tomorrow's World* partnership with the BBC, Wellcome Trust, Open University and Royal Society within its *Robots* exhibition, attended by Lord Hall, Brian Cox, Group director Ian Blatchford, partners and press to announce we wanted to find new ways to engage with 18- to 35-year olds.

The BBC initially offered more than 40 hours of TV and radio programming, notably a BBC Four two-part series, *Rise of the Robots,* inspired by our exhibition and BBC Two's 90-minute *Britain's Greatest Inventions*, which attracted almost 2 million viewers as it was broadcast live from the National Collections Centre in Wroughton. The programme trended on Twitter for much of the night, with the Group's content seen over 300,000 times.

Another component of the partnership honoured the original digital vision of *Tomorrow's World* in the form of a digital hub/platform to showcase the best short-form partner stories, content and insight. Thanks to a link from the BBC homepage, our video *Tim Peake's Five Facts about Space* was seen a quarter of a million times.

There were also *Tomorrow's World Live* events, webcast via partner Facebook and other sites. The first was broadcast from the Science Museum's August Lates on the theme of space, reaching an online audience on the night of 150,000.

A second webcast, focusing on *Robots*, which was broadcast from the Museum of Science and Industry, reached similar audiences and a third, featuring Brian Cox discussing artificial intelligence with Eric Schmidt of Alphabet, engaged with around half a million people in all.

Finally, in the spirit of the partnership, we renamed the *Antenna* gallery in the Science Museum *Tomorrow's World* in the summer of 2017 to give greater clarity about its focus.

To improve the way the Group deals with audiences, we rolled out a new customer relationship management system (CRM), called Tessitura, for ticketing, emails and so on to help us give visitors what they really want, rather than what we want them to want.

The National Science and Media Museum has used it for its *Wonderlab* interactive gallery – the first gallery or exhibition to be ticketed at the museum. Since opening in March 2017, 130,000 free tickets have been allocated and 14% of bookers have signed up for email newsletters.

The Museum of Science and Industry has been experimenting with ticketing to improve visitor experience during the *Manchester Science Festival*. In November, *Star Wars* fans queued online from 7am to snap up tickets for *The Last Jedi* in the Science Museum's IMAX, which can show the film in 70mm. While rival cinema chains' websites crashed, our Queue-it software provided trouble-free service and sold almost 7,000 tickets in one day.

Meanwhile, Locomotion and the National Railway Museum used the new CRM for advance sales of the virtual reality experience with astronaut Tim Peake that accompanies the tour of his Soyuz spacecraft. In York, 70% of VR tickets were sold online in advance; a huge increase on previous records that will also give us a greater insight into our visitors.

'Tomorrow's World is going to be much bigger than a television programme'

Lord Hall, BBC director general

Below: 'Create Your Own Creature' – visitors build a creature by making a wire frame skeleton, then bring it to life using stop motion animation

Bottom, Sleep Lab scientists from the University of Oxford and MRC Harwell explain their methods

INDIA'S HISTORY AS NEVER SEEN BEFORE

Our exhibition on the pioneers of photography on the sub-continent broke new ground

Illuminating India was a season of exhibitions and events in the Science Museum that celebrated the nation's huge contributions to culture. Running alongside *5000 Years of Science and Innovation* was a second free exhibition, *Photography 1857–2017,* which examined photography's changing role in charting its history.

This exhibition was the first to trace an arc from the beginnings of photography in India to the present day. It pivoted around two key dates, 1857 and 1947, and featured photographers who were inspired by their own experiences of the country, from India's first known photographer, Ahmad Ali Khan, to award-winning contemporary photographer Vasantha Yogananthan.

Arriving in India shortly after its invention in Britain in 1839, photography became a powerful tool in the hands of the military and colonial administrators in the drive to document and dominate the people, architecture and landscapes of the subcontinent. Western art history has tended to overlook the Indian photographers working with the first foreigners from the 1850s.

This exhibition explored their work afresh in an international context, as Indian art photography pioneer Marahaja Ram Singh II was exhibited alongside Samuel Bourne and the country's first female photojournalist, Homai Vyarawalla, was shown with contemporaries Henri Cartier-Bresson and Margaret Bourke-White.

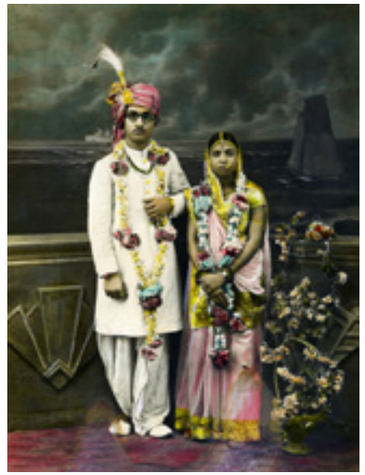
Drawing on exceptional loans from diverse international collections, some of which were on show for the first time in the UK, the exhibition offered a visually sumptuous history of photography in India. From the first fragile salt prints to the latest digital imagery, every iteration of the medium featured.

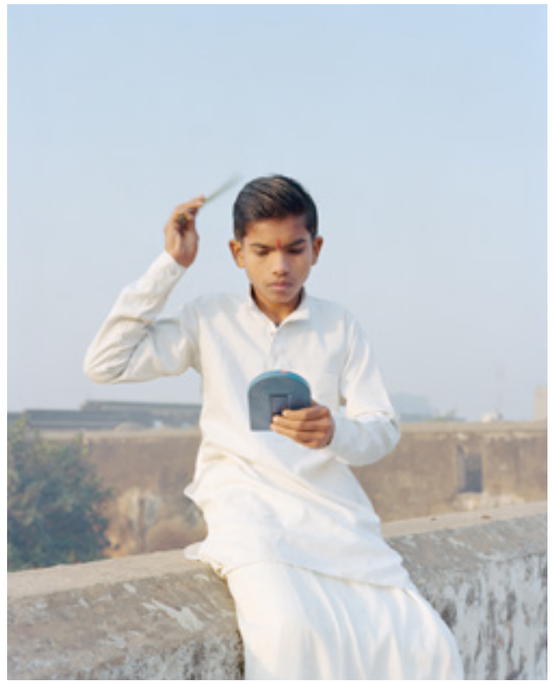
With some of the exhibition's most remarkable loan materials coming from the Alkazi Collection of Photography and the collection's curator, Rahaab Allana, joining the team as consultant curator, a symposium launched the exhibition in October, entitled *India's Place in Photography's World*.

The symposium was chaired by Rahaab Allana, and speakers included Sunil Gupta (visiting professor of photography at the National Institute of Design, Ahmedabad), Clare Harris (curator for Asian collections at the Pitt Rivers Museum) and independent curator Latika Gupta.

On 23 March, Mercury Prize-winning composer, producer and tabla player Talvin Singh OBE presented the world premiere of a new live musical response to *Illuminating India: Photography 1857–2017*. Commissioned by the Science Museum, Singh's compositions were accompanied by specially produced visuals incorporating still images from the exhibition alongside archive footage.

Right: Wedding Portrait of an Indian Couple, circa 1920
Bottom: Rama Combing His Hair, Ayodhya, Uttar Pradesh, 2015, © Vasantha Yogananthan





Above: The Promise © Vasantha Yogananthan
Left: sarangi player Suhail Yusuf Khan
Below: Sitarist Mehboob Nadeem

'On the occasion of India's 70th anniversary as an independent nation, such a venture comments on the medium's restless gait, its rise to challenges over time'

Rahaab Allana, Consulting Curator for Illuminating India: Photography 1857-2017

THINKING BIGGER...

AND BETTER

Our new National Collections Centre will provide a purpose-built 'green' home for 340,000 objects

This year our site in Wroughton, Wiltshire, was renamed the National Collections Centre to reflect the size of our plans for its future. As part of the largest and most ambitious project the Science Museum Group has undertaken in recent times – One Collection – we are investing in a huge new building to house our collection.

Designed to blend in with its surroundings, yet set a benchmark for sustainable care, the National Collections Centre will be enormous. At 90m across and almost 300m long, it will provide 27,000 square metres for the Group collection – equivalent to four football pitches.

The facility will provide a stable, safe and an energy-efficient environment for our collection and improve the process of preparing objects for display in new galleries and exhibitions across the Group and for loan to museums in the UK and beyond. Our aim is to ensure we can increase public access to, and continue to care for, our incredible collection for many years to come.

The new building will replace our stores at Blythe House in west London, with the relocation of 320,000 objects, beginning in 2020. A further 20,000 objects will move out of the hangars at the National Collections Centre. And there will also be space for other heritage organisations' collections.

Once complete, the facility will be home to more than 80% of the Group's collection and will be accessible to the public through tours, school and research visits.

Moving this vast number of objects has created opportunities to review our collection, improve our records and increase public engagement. Throughout the relocation the Group will undertake an unprecedented digitisation programme, creating one of the most extensive online science collections in the world.

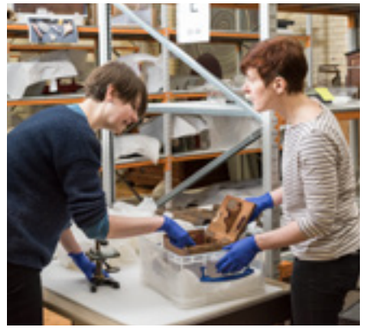
Detailed preparatory work has been completed for the construction. The planning application, which was submitted to Swindon Borough Council on 21 December 2017, was given formal consent on 10 April 2018. Building work is scheduled to begin in late 2018, with the first public tours by 2023.

National Collection Centre on TV

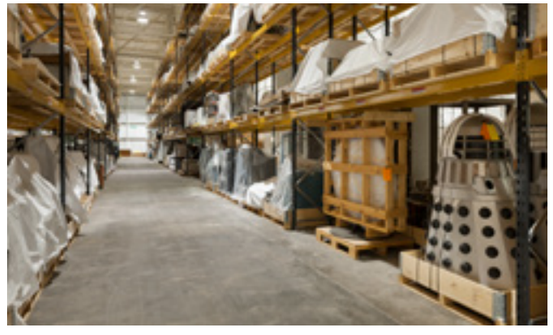
In June 2017 almost 2 million people watched as BBC Two broadcast *Britain's Greatest Invention*, a live 90-minute programme hosted by Dr Hannah Fry and Ant Anstead, from hangar D4.

Several Group curators – including Selina Hurley, Dr Oliver Carpenter, Dr Elizabeth Bruton, Doug Millard and Elinor Groom – were part of the programme, which featured seven celebrities arguing for their favourite invention in front of an invited local audience and surrounded by our incredible collection. The celebrities included Giles Coren (fridge), Len Goodman (steam engine), Angela Scanlon (mobile phone), Sir Trevor McDonald (television), Angela Rippon (antibiotics), David Harewood (jet engine) and Nick Knowles (concrete).

The programme trended on Twitter for much of the night, with many thousands of people engaging with the Group on social media and local newspapers, radio and TV also covering the programme.



Above: Preparing for the big move in Blythe House



'I am enormously proud to have hosted the BBC live special delving into their marvellous collection and worked closely with them on a number of other events in the past year'

Dr Hannah Fry, UCL,
host of Britain's Greatest Invention

Above, clockwise: A Dalek enjoys pride of place in one of the current stores at the National Collection Centre; some of the One Collection team at Blythe House; *Britain's Greatest Invention*, featuring Hannah Fry, Ant Anstead, Len Goodman, Angela Rippon, David Harewood, Sir Trevor McDonald, Nick Knowles, Angela Scanlon and Giles Coren

RETURN TO CONTENTS PAGE

TAKING CARE OF THINGS BACK ON EARTH

Conservation and restoration are a huge – but often unseen – part of the museums' work. And it never stops...

To boldly keep on going
Although the Soyuz TMA-19M descent module in the Group collection survived a journey into space and back – carrying British ESA astronaut Tim Peake, NASA's Tim Kopra and Russian cosmonaut Yuri Malenchenko – the fiery re-entry through Earth's atmosphere caused the craft's exterior to become very brittle. Conservators Jannicke Langfeldt and Sadie Wilson performed consolidation work on the surface, enabling Soyuz to embark on the national tour (*see page 8*).

While it's common to photograph objects in detail, it's very rare to be required to be inside one to do it – but this was the challenge for photographer Jennie Hills and curatorial and conservation colleagues. The confined space presented many physical and photographic problems, from illuminating detail without casting shadows to keeping your knees out of the shot.

A return to the Moon by train
As just one of many trains we care for, the 2HAP seems unremarkable at first. Yet this vehicle represents mass train travel and is one of only two survivors in the UK. This 2HAP is also the most travelled train in the collection (covering five times the distance to the Moon and back). It operated from 1957 to 1997, carrying millions of commuters to and from London. The restoration of this 2HAP is underway in the workshop at Locomotion, with the help of the volunteer Project Commuter team. Our aim is that once completed it will go on public display.

First-class treatment
As well as the historic restoration of Queen Victoria's royal saloon, funded by a private patron, staff and volunteers at the National Railway Museum have brought a replica third-class carriage from the Liverpool and Manchester Railway back to its former glory.

Dating from the 1830s, the open-air carriage is older than many original collection items and forms a set of two carriages which can be pulled behind a replica of George Stephenson's locomotive *Rocket*.

The wooden carriage was first stripped, and surfaces filled and prepared, before being repainted in Kingfisher Blue to match the authentic livery used in the 1830s. The carriage received six coats of paint and five coats of varnish to ensure it can withstand the worst of the weather.

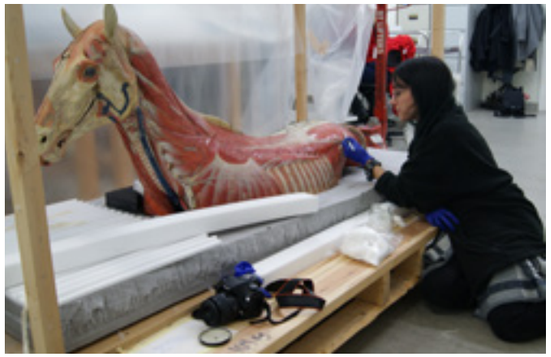
Moscow-bound photos
In Bradford, the National Science and Media Museum team facilitated one of our largest recent loans, 143 photographs for *William Henry Fox Talbot: At the Origins of Photography*, an exhibition at the Pushkin State Museum of Fine Art in Moscow. Our photographs formed the bulk of the exhibition, which ran until 9 April 2018.

Left: Science Museum photographer Jennie Hills captures the interior of the Soyuz TMA-19M
Above: The rare Megalethoscope made by Carlo Ponti of Venice in 1862

Bottom: Model of the Blue Star Line twin-screw turbine steamer Arandora Star, modified to show it converted to a cruise ship, 1927–1946

'We're restoring the outside of Queen Victoria's royal saloon to its former glory using the newest conservation-grade materials. The response from the public has been fantastic'

Chris Binks, conservation assistant at the National Railway Museum



Below: The Class 414 2HAP electric multiple unit train is restored at Locomotion in Network South East livery

Above: A Science Museum conservator undertakes intricate cleaning work on the papier-mache anatomical model of a horse

New berth for Blue Star liner
Visitors to the Science Museum's *Making the Modern World* gallery can now enjoy a gigantic model of Blue Star Line's Arandora Star. Acquired in 1946, this scale model of the twin-screw turbine steamer was recently conserved at the National Collections Centre in Wroughton by Simon Stephens. Significant splits in the hull needed repair.

Getting ready for Lates
The Science Museum's curatorial and conservation teams work together each month to identify and prepare objects from the collection for public view at Lates. Visitors have also had the rare opportunity to tour the conservation lab and learn about its highly skilled work.

Dusting off a very old horse
Our half life-size papier-mache anatomical model of a horse has been prepared for redisplay in the Science Museum's *Medicine Galleries*, which will open in 2019. Since it was created in late 1800s France, nearly two centuries of ingrained dust and dirt have given the horse a dull and dark appearance. The conservation team worked to stabilise the object – then cleaning revealed annotated labels.

Studying the rare Megalethoscope
This year, the National Science and Media Museum received an unusual request from the Royal Albert Memorial Museum to study a rare Megalethoscope in the Science Museum Group collection.

Designed by Venetian Carlo Ponti in the 1860s, Megalethoscopes create optical illusions of depth and perspective using large lenses. The illusion is assisted through viewing the photograph on curved albumen plates, which can be backlit or lit by daylight so the image changes from a day to night-time scene. The request to examine, photograph and partially dismantle our Megalethoscope led to 11 slides of photographic views being reunited with the device.

A NEW WAY OF LOOKING

An exhibition of the euphoric highs and crushing lows of match day at Bradford City Football Club was among the unexpected delights across the Group last year as we explored new ways to engage with visitors.

Photographer Nudrat Afza was first taken to a Bradford City game in 2014 by a friend and 'was struck by the energy of the fans, particularly the women and girls'. Afza was supported by Oscar-winning screenwriter Simon Beaufoy, writer of *Slumdog Millionaire* and *The Full Monty*. Over the following two years, she photographed hundreds of fans for *City Girls*, a celebration of their passion, commitment and camaraderie.

Another unusual offering was *Supersenses*, a family exhibition which provided an opportunity to hear the Big Bang of creation, test their taste buds, and see the world like a dragonfly, frog or owl. In *Sensory Soundpits*, visitors could use sand to shape soundscapes and visual mixes.

In London, to celebrate the 60th anniversary of the first British space rocket Skylark, a new exhibition of the same name told the stories of the engineers and scientists who used 441 launches of the rocket to lay the foundations for the UK's space programme today, ranging from world-leading space science to the design and building of satellites.

Rail provided a narrative link between several exhibits and events across the Group. In Manchester, a stunning new photography exhibition, *Changing Places, Creating Spaces* at the Museum of Science and Industry, relied on staff to pick images that charted the history of the museum and restoration work carried out since it moved to the site of the historic Liverpool Road Station in 1983. The Grade 1 listed building was the terminus of the record-breaking Liverpool and Manchester Railway, built in 1830 by local businessmen to link their factories with the docks at Liverpool.

'I loved being out of my Call the Midwife habit, to play a somewhat dubious character in the Pandemic interactive film. I hope I didn't persuade too many people to go along with my questionable values'

Jenny Agutter on her role in Pandemic, a choose-your-own adventure film created by John Bradburn in collaboration with the Science Museum

Above: Locomotives around a turntable at York engine shed, about 1950. It is now the site of the National Railway Museum's Great Hall, which includes one of the turntables
Right: Visiting members of the Rail Camera Club
Below: A visitor enjoying the *Highlights* exhibition at the National Railway Museum in York

'City Girls was a beautifully curated exhibition'

Simon Beaufoy, screenwriter

Opposite page, clockwise from top: *City Girls* exhibition opening. (left to right) Bradford City goalkeeper Lukas Raeder, Oscar-winning screenwriter Simon Beaufoy, photographer Nudrat Afza, Bradford City women's team captain Shauna Legge. *Supersenses* colour matching challenge. An illustration from the museum blog Changing Places A gallery view of *Skylark: Britain's Pioneering Space Rocket* celebrating the 60th anniversary of the rocket programme

Rail Cameramen, featuring the artistry of many of the UK's leading railway photographers, opened in Locomotion in Shildon at the start of 2018. Sponsored by Hitachi Rail Europe, Bachmann Europe, the Bluefin Group, the *Railway Magazine*, and the Bahamas Locomotive Society, the exhibition showcased the work of the Rail Camera Club, including W J V 'Bill' Anderson and Eric Treacy.

The National Railway Museum in York began 2018 with an exhibition designed to show why the railways are still essential supported by Friends of the Museum. *Highlights* overlooks the Great Hall and draws on parts of the collection seldom seen, such as engine driver Wallace Oakes's George Cross medal, awarded posthumously in 1965 after he stayed aboard a burning locomotive to prevent a more serious accident. Other items include 16 rare paintings such as *Service to Industry* by Terence Cuneo (*see inside back cover*) commissioned by British Railways to show the importance of rail modernisation.

The restoration of Queen Victoria's royal carriage has been taking place during opening hours in York so visitors can see conservation in action. Built in 1869, the carriage was the Queen's favourite and was lavishly finished in teak with precious silks, satin wood and bird's eye maple. The restoration involves applying sheets of 23¾ carat gold leaf by hand, coating with a synthetic UV-resistant varnish and repainting in original colours.

Readers of the museum's blog could also enjoy some unexpected literary delights in stories by creative writing students at York St John University, inspired in part by our collection.

This year, to celebrate the remarkable contribution that the National Lottery has made to our five museums over more than two decades, we also offered all our visitors the chance to win a grand prize of a trip behind *Flying Scotsman*, which recently began a UK tour.

The Science Museum Group has received more than £65 million since 1995 from Heritage Lottery Fund (the total amount given to the National Railway Museum is £3,370,000). However, it is the restoration of *Flying Scotsman* that has captured public imagination, being a star of engineering for almost a century and one of the UK's enduring global ambassadors.

THE BEAUTY OF MATHS

The Science Museum Group hosted some very special events, featuring music, mathematics and charity fundraising

An encounter with one of the world's leading mathematicians, helping a nationwide effort to raise £50 million for charity, critically acclaimed theatre and a BBC radio birthday celebration, are among the special events that took place across the Group in the last year.

Our museums are in constant demand to host major events and filming and this year proved no exception. When the BBC approached the Museum of Science and Industry to be a venue for Children in Need, 'we were delighted to help,' said Sally MacDonald, the director.

The BBC spent two days building a studio in the *Revolution Manchester* gallery and among the highlights was when children in the museum joined in with more than 1,500 others at 10 venues across the country to form the Children's Choir. Together, they performed Ariana Grande's *One Love* Manchester arrangement of *Somewhere Over the Rainbow*.

'The 10 choirs were stitched together in real time by the BBC production team to be broadcast live as one whole performance – it was an amazing technical feat,' said Sally MacDonald.

In July the museum's historic 1830 Warehouse hosted *The Welcoming Party*, a production about refugees created by Theatre-Rites, one of Europe's most creative companies. The event, part of the Manchester International Festival, featured in the 'Best of 2017' round-ups of *The Guardian* and *What's On Stage*.

Dr Hannah Fry and Sir Andrew Wiles at the Science Museum event

'It was a pleasure to give the inaugural Oxford Mathematics lecture in the Science Museum. This allowed us to reach new audiences'

Sir Andrew Wiles, University of Oxford

Above: The stage was set for Dr Hannah Fry and Sir Andrew Wiles; **Top right:** Comedian and TV presenter Dara O'Briain asks Sir Andrew a question

One of the world's greatest mathematicians, Sir Andrew Wiles, winner of the Abel Prize (mathematics' equivalent of the Nobel Prize), made a rare public appearance at the end of November in the Science Museum with Dr Hannah Fry of UCL to discuss his latest research, his belief in the value of struggle, and how to inspire the next generation.

Sir Andrew made global headlines in 1994 when he reported that he had cracked Fermat's Last Theorem, so named because it was first formulated by the French mathematician Pierre de Fermat in 1637. In an electrifying event introduced by Dame Mary Archer, Sir Andrew likened the mathematical equivalent of experiencing the rapture of beauty in a discovery to walking down a path to explore a garden by the great landscape architect Capability Brown, when a breath-taking vista suddenly beckons.

The theme of mathematical creativity came up again, at a special Royal Society event held as part of the *Illuminating India* events, when mathematician Dr Eugenia Cheng and Royal Society president Sir Venki Ramakrishnan discussed the mathematical genius Srinivasa Ramanujan with the Science Museum's director of external affairs, Roger Highfield.

In Bradford's National Science and Media Museum visitors could enjoy *Radio Reinvented*, a special free event held in partnership with the BBC and media historians at the University of Sussex to celebrate 50 years of Radio 1, 2, 3 and 4, which began broadcasting in 1967.

Elinor Groom, curator of television and broadcast, described the event as a 'must for any radio lover', adding that it was 'full of behind-the-scenes glimpses into the wonderful world of BBC radio broadcasting'.

Left: The Children's Choir performing in Manchester

RETURN TO CONTENTS PAGE

OUR WONDERFUL VOLUNTEERS – INSPIRING FUTURES

Whether it's front of house or behind the scenes, we have a passionate and dedicated team offering their help, expertise and experience

'I've been volunteering for almost 11 years and this is the best experience I've had!'

SMG volunteer, satisfaction survey

Above: From tour guides to information points, our volunteers are on hand to help visitors with what they need

Our busiest year yet

Over the past 12 months, 831 volunteers contributed 86,315 hours to our museums, making it our busiest year yet. Much of this support came from our front of house teams, with Science Museum guides providing 1,000 tours, cab access up by 56% at Locomotion, to 26,657 visits, and National Railway Museum miniature railway drivers and guards helping to generate £230,000. Alongside this, companies like Siemens, ABTEM and Hitachi have provided volunteers to help us run school workshops and STEM activities.

In January, the Museum of Science and Industry's computing volunteers demonstrated BABY, the world's first stored-program computer, for the European Network on High Performance and Embedded Architecture and Compilation (HiPEAC) computing conference. Their efforts received praise from Mikel Lujan, event organiser: 'Interacting with you and learning about the "BABY" has been phenomenal. I can only say well done!!'

Bringing exhibitions and events to life

From the Tim Peake exhibition at Locomotion, to Lates at the Science Museum, this year volunteers contributed more than ever to our events and exhibitions. In London and Manchester *Robots* volunteers gave 6,000 hours to answer inquiries and provide visitors with deeper insights. Through *Future Engineers*, at the National Railway Museum, 176 volunteers shared their engineering experience and ran STEM activities. In Manchester, our science festival volunteers engaged the public

'The Science Museum has been a wonderful place to volunteer - I have learnt a lot and it has helped my own professional development'

Anonymous, SMG Volunteer Survey

Above: Volunteers like Colin provide an enthusiastic and amazing welcome to all our visitors, no matter what their age
Right: Across SMG volunteers are helping to build science capital
Below: A volunteer from the Sir Nigel Gresley Locomotive Trust working on the locomotive at the National Railway Museum in York

operation of historic machinery. Helping with the management of volunteers across the Group are Brian Gardner and Tony Oldfield. This year they developed a process for managing health and safety and reworked the intranet to provide greater supervisor support. With the appointment of our One Collection (*see page 38*) volunteering manager, behind the scenes volunteering is set to take off, with around 300 volunteers expected to support photography, records enhancement and packing during the project.

Leading from the front

We're committed to becoming the leading national museum for volunteering, so it's vital it is mutually beneficial. This year, we introduced a satisfaction survey. We were delighted with the results, with 91% saying the experience benefited their health and wellbeing and 93% saying they'd recommend us as a good place to volunteer.

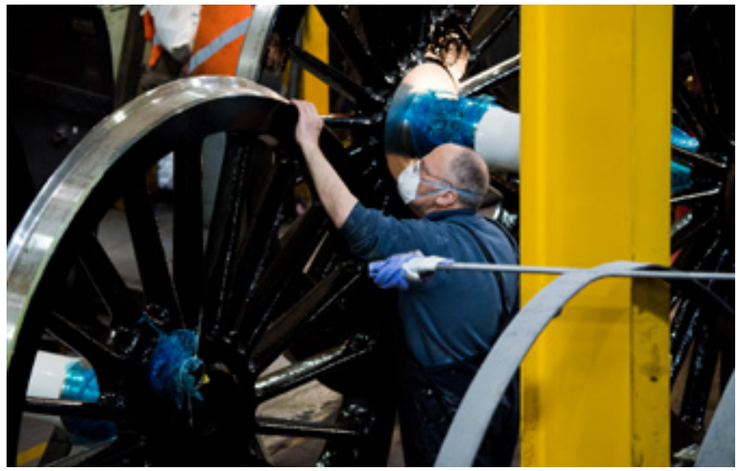
Not content to rest on our laurels, we have overhauled our volunteer management training, increased online support for supervisors and have implemented an exciting programme of volunteer activities – including international visits, training and opportunities to meet senior management.

Through our leadership of the Heritage Volunteering Group, we're working with organisations like Museums Association and the National Trust to share our practice and transform the sector. Alongside this, our coordinators play a lead role in local volunteer management groups, ensuring the Science Museum Group is at the forefront of volunteer management.

in STEM activities across the city, giving an incredible 2,300 hours of their time in just ten days. While in Bradford, London and Manchester 70 gamers took volunteering to the next level by providing more support than ever for *Power UP* and the *Yorkshire Games Festival*.

Behind the scenes

It's not just front of house volunteers who make a difference. At the National Science and Media Museum library, volunteers catalogued half of our periodical collection, while Kath Carlton has catalogued a third of the administrative archive of the *Impressions Gallery*. At Locomotion and the National Railway Museum, workshop volunteers have been restoring the 2HAP railway unit and at the Museum of Science and Industry Peter Sharpe created documentation for the



INSIGHTS AND **EXCITEMENT OF DISCOVERY**

Once a year, curators and staff across the Science Museum Group get together with academics and colleagues from other institutions to share ideas

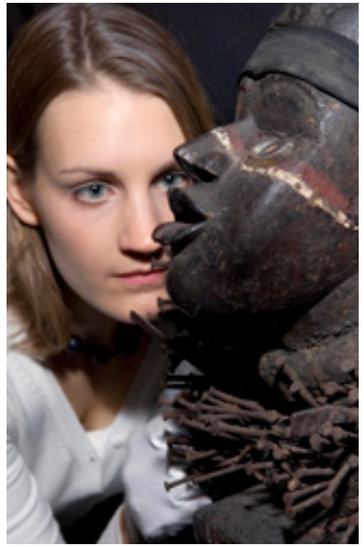
Late November 2017: an excited crowd gathered at the National Science and Media Museum's Cubby Broccoli Cinema. Here were curators and a wide range of Science Museum Group staff mixing with academics and colleagues from museums outside the Group. Their purpose? To share the insights and excitement of teir research at the second annual Group Research Conference. Research is the foundation of so much of what we do across our museums, but we don't always get a proper opportunity to talk to each other about it. That's why we started this annual event, which travels between our museums. As it touches down, it expresses the flavour of local concerns; being in Bradford meant a special interest in sound and vision, which will be the governing themes of that museum's major permanent galleries when they open in a few years' time.

'The project was born of a desire to understand how the museum can be of use to the city, whilst remaining true to its focus on the science of sound and image technologies'

Lynn Wray, Researcher, National Science and Media Museum, Bradford

Alongside the conference, museum visitors were enjoying one of the Group's research collaborations. ADAPT is a European Research Council funded project based at Royal Holloway, University of London, researching and recording the practical skills behind the making of TV programmes. Professor John Ellis's project has brought in retired TV technicians to show how programmes used to be made. At the National Science and Media Museum, they had a working outside broadcast set-up, where visitors could be interviewed, or take a hand in vision-mixing a programme. As a Group, we take a particular interest in this kind of practical research, which helps us to understand the working lives of objects in our collections.

At the same time, the Group has been able to embark on three substantial research projects this year, thanks to funding from the Arts and Humanities Research Council and the Leverhulme Trust. The museum in Bradford is home to AHRC-supported 'Bradford's National Museum', a collaborative project with local communities and the University of Leeds. Led by Dr Helen Graham from the university, it looks into what it means to be a 'national museum' in Bradford, a deindustrialised, regional city, with a significant history of migration from India, Pakistan and elsewhere. *Metropolitan Science* is funded by the Leverhulme Trust and led by Dr Becky Higgitt from the University of Kent. It is delving deep into the Science Museum's rich collections of pre-1800 scientific instruments to establish connections between the commercial culture of early modern London and the rise of science. AHRC-funded *Energy in Store*, led by Anna Woodham of Kings College London, is linked in to the *One Collection* project. It enables us to bring in lay experts to help us understand the values of the Group's energy collections as we prepare to move to the National Collections Centre.



Left: Science Museum exhibition developer Alice Nicholls
Below: The new publication by curator Helen Peavitt, described by the *Spectator* as 'a book of hallucinatory wonder... rare combination of synoptic, grandiose academic majesty and wry humour'

In print
This year saw the publication of curator Helen Peavitt's new book *Refrigerator: The Story of Cool in the Kitchen* (Reaktion Books). This is the latest in a series of fully illustrated books featuring the histories of the kinds of objects in our collections.

Left: Engraved day and night dial in form of watch made by Allen, Elias. Engraved Elias Allen fecit, around 1616

Right: ADAPT LIVE, part of the Being Human festival, reunited veteran TV crews from Britain's earliest colour TV shows at the Group research conference

PEOPLE AT THE HEART OF OUR RESEARCH

The fifth birthday of the Science Museum Group's Research and Public History department fell this year. The anniversary provides the opportunity to reflect on the great strides our museums have made in establishing a research culture. Thinking of our master's degree option and the doctoral programme we run, the research projects we pursue, the conferences we hold and the progress of the *Science Museum Group Journal*, we have much to be proud of.

At the heart of our progress are people: the Group's own staff, and the students, authors, co-investigators, speakers and attendees who work with us. This research community is vividly showing what research can do for a national museum group.

This year, the *Science Museum Group Journal* published online its eighth and ninth issues. Now nearly five years old, this publication has moved from start-up to be an established title. We like to publish articles of many formats, some written by our staff, but as many penned by colleagues in other museums and universities. Our only rule on subject matter is that the journal is for people who are interested in the same kinds of things as we are; that includes the history of technology, of course, but also conservation, audience research, history of museums, and much else besides. The *Journal* also consolidates our other work. It is worth noting that one of the joint winners of our first essay prize was Josh Butt, a doctoral student working at the Museum of Science and Industry, exploring why Manchester ended up without a car industry. Another collaboration, the Arts and Humanities Research Council funded Material Cultures of Energy project, run by Professor Frank Trentmann of Birkbeck College, has not only held two workshops here, but has also provided the content for a special issue of the *Journal*, published in spring 2018.

Our collaborative doctoral programme, funded by the AHRC, is one of the largest in the world. Our consortium brings together all the Group's museums with BT Archives, the Royal Society, and the Royal Geographical Society/Institute of British Geographers. All of us hold very substantial collections and archives; being able to award doctoral studentships gives the opportunity for really substantial research into our collections, audiences and broader concerns. Since 2013, we have awarded 35 studentships, and we are involved with more than 20 universities in their supervision. This year, graduating students completed theses on subjects as various as the response of industry to germ theory, Daphne Oram's amazing Oramics Machine synthesiser, domestic chemicals, and the GPO research station.

Several of our doctoral alumni have come to work for us; others are lecturing or researching in universities. We agree with the funder that this form of training opens up a wide range of employment opportunities. And this motivation – to enable people to gain insights into museum work, even as they pursue their studies – is part of our motivation in running an MSc option for University College London's Science and Technology Studies Department. Curating Science and Technology is in its fourth year, and has attracted 16 students eager to learn about what is special about the museum pursuit of the history of science and technology.

Left: An early example of the McArthur portable microscope, with one eyepiece and one objective lens, made in 1938

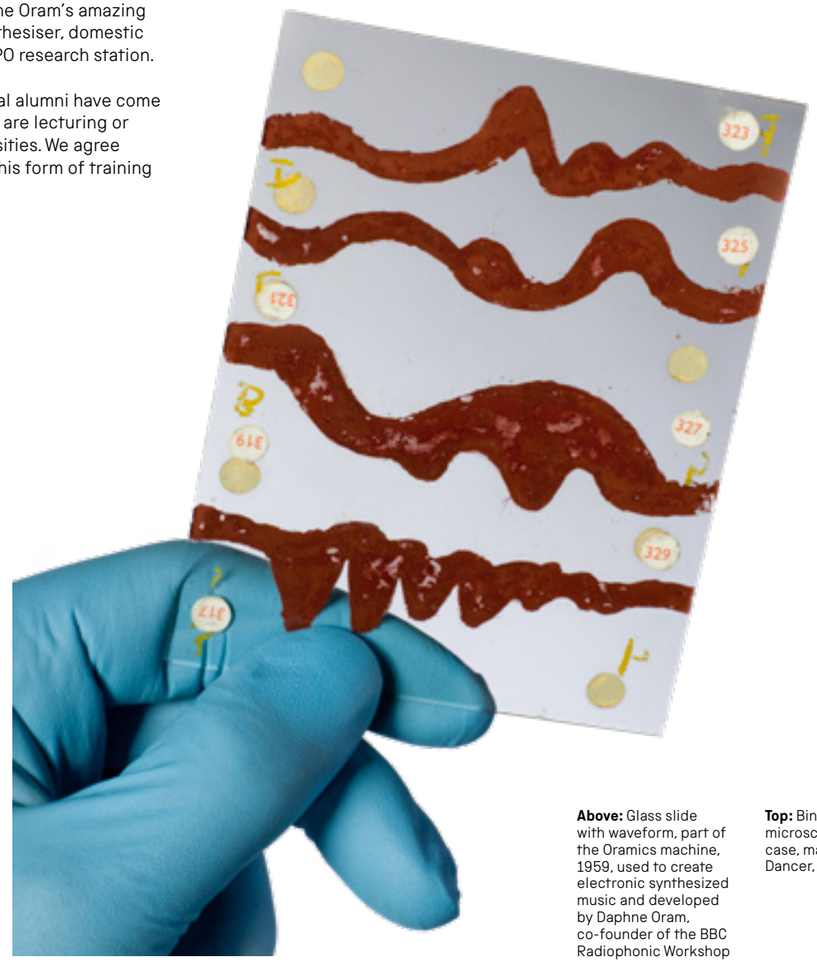
Far Left and below: Tori Miller, photography team leader for One Collection, and David Godfrey, storage system assistant in the role of volunteer at Blythe House, piloting photography set up for Blythe House move

RESEARCH

'Our only rule on subject matter is that the journal is for people who are interested in the same kinds of things as we are'

Science Museum Group Journal

Top: Binocular microscope with case, made by J B Dancer, circa 1855



Above: Glass slide with waveform, part of the Oramics machine, 1959, used to create electronic synthesized music and developed by Daphne Oram, co-founder of the BBC Radiophonic Workshop

‘We’re proud to support this important exhibition, which helps to raise awareness of the scale of this global health challenge.’

Erik Nordkamp,
managing director Pfizer UK

SUPERBUGS: THE FIGHT FOR OUR LIVES

The Science Museum has highlighted a potentially catastrophic threat to health – antibiotic resistant bacteria. But could the Komodo dragon slay our foes?

We share our world with bacteria. While many are harmless, they can also cause infection and death. Thanks to antibiotics, millions of people each year are cured of previously untreatable bacterial diseases. But bacteria have fought back, evolving into superbugs resistant to even our most powerful antibiotics. *Superbugs: The Fight For Our Lives* at the Science Museum explores humanity’s response to the unprecedented global threat of antibiotic resistance.

To celebrate the launch of the exhibition ahead of WHO World Antibiotic Awareness Week, the museum held a breakfast event with guest speakers Erik Nordkamp, managing director at Pfizer UK, Angela Rippon, whose life was saved by antibiotics, and Lord O’Neill, chairman of the Review of Antimicrobial Resistance, and showcased the ground-breaking research taking place to combat one of the greatest threats to society today.

Superbugs kill over 700,000 people worldwide and this is forecast to reach 10 million by 2050 largely due to overuse and misuse of antibiotics. ‘A key part of tackling this issue is increasing public awareness and working together to find solutions,’ says the chief medical officer, Professor Dame Sally Davies. ‘This exhibition clearly highlights some of the key issues we are trying to address, and crucially, tells stories about real people.’

Visitors can hear the remarkable stories from the front line of the war on superbugs, including Geoffrey Pattie who spent five months in isolation after contracting a superbug during surgery. Also on display are 12 bacteria colonies grown by bioartist Anna Dumitriu, as well as a clone of Alexander Fleming’s penicillium mould taken from his original samples. Visitors can even take charge of a global health organisation in a new interactive game developed exclusively for the exhibition and attempt to stop the spread of superbugs.

Now over 30 years since the last new class of antibiotics was approved for use, it is still unclear when another may be found. Could the answer lie on the bodies of Brazilian leafcutter ants or in the blood of Komodo dragons? According to Erik Nordkamp: ‘No one person or organisation has all the answers, nor is there one solution,’ but as the exhibition highlights, ‘education has to be a key piece of the puzzle’.

Top: A collection of bacterial colonies produced by Anna Dumitriu for the exhibition
Below left: Artist and microbiologist Anna Dumitriu with a bacterial colony
Below right: Dried Brazilian leafcutter ants on display in the exhibition

EPIC VOYAGES OF REDISCOVERY

The acclaimed fine art photographers Anderson & Low brought a remarkable new lease of life to our superb – but off display – collection of shipping models at the beginning of the year, with their photography series *Voyages*.

The Science Museum’s Ships Gallery closed in 2012 to make way for *Information Age*, which was opened by the Queen in October 2014. The model ships that had captivated visitors to the gallery since the 1960s were moved to our off-site collection management facility in specially constructed protective crates.

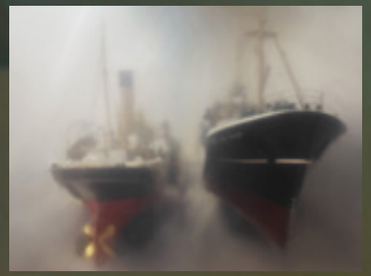
But when Anderson & Low happened to come across the models last year on a visit to the museum’s object store at Blythe House, they visualised them in a new light. Photographed through the protective covers, and with only the ambient light of the store rooms, the models were re-imagined to give them a hazy, romantic quality, reminiscent of paintings by J M W Turner.

The old models now conjure up evocative new narratives: dramas about storm-tossed journeys through vast seascapes, epic tales of voyages to strange lands, and stories of legendary vessels that loom from ominous fogs. These new viewpoints on the maritime world keep our collections alive, even after they have moved off display.

Leading creative figures were transported to fantastical worlds as they attended a lunch organised by the *Mail on Sunday* arts correspondent Chris Hastings, with the support of producer Michael G Wilson, who had previously invited Anderson & Low to create a project around the James Bond film *Spectre*.

Addressing figures such as Jenny Agutter, Glenda Jackson (below right), Miranda Richardson, Jeremy Irons (right), Sir Alan Parker, Stephen Frears, Ben Okri, Arlene Phillips, Lord Robert Winston and Dame Jenni Murray, Anderson & Low commented that their *Voyages* series is about ‘using one’s imagination and sharpening one’s senses, and that if one does this, then one can find magic everywhere. One of the singular parallels in the history of science and art is that one can look at the world in a different way, and re-imagine what it might be.’

They also cited Turner – ‘I paint what I see, not what I know to be there’ – and the eminent physicist William Bragg, who declared: ‘The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.’



‘The real voyage of discovery consists not in seeking new landscapes, but in having new eyes.’

Marcel Proust

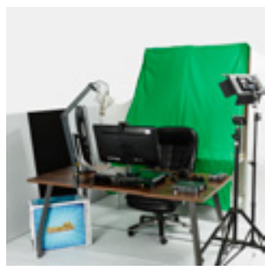
WHAT WE ACQUIRED

In 2017–18 we added 420 objects to the Science Museum Group Collection – in addition to Tim Peake's Sokol KV-2 emergency spacesuit. Here are 10 other highlights...

Prototype paramedic bicycle, 2000
This revolutionary paramedic bicycle – gifted by Tom Lynch MBE, London Ambulance cycle response unit manager and former BMX champion – enabled Lynch to rapidly navigate congested traffic and pedestrianised areas.

Sundial layout-plate, about 1700
This extremely rare French-made laying-out plate was used by a sundial maker to mark out scales prior to engraving. It will feature in the Science Museum's *London: Science City* gallery.

Automaton of a bird in a cage, about 1900–1910
The quality and realism of the birdsong made by automata, such as this stunning example, was widely praised. It is one of seven automata purchased for the SMG collection through HLF Collecting Cultures funding.



Yogscast studio equipment, 2017
The full suite of original studio equipment used by Bristol-based Yogscast, one of the biggest YouTube broadcasters in the world and the first UK YouTube channel to reach 1 million subscribers.

Nagra SN tape recorder, 1970–1979
Originally produced at the request of the Kennedy administration for the US secret services, the Nagra 'Series Noire' was frequently used by the CIA, KGB and Stasi for covert recordings from 1960 to 1990.

George Cross and Carnegie medals, 1965
Awarded posthumously to driver Wallace 'Wally' Oakes for his bravery when remaining aboard a burning locomotive to prevent a serious accident and saving many lives. Purchased with help from the Friends of the National Railway Museum.

Electro-plated nickel silver teapot, 1920–1929
The station staff and residents of the village of Borwick presented this teapot in thanks to the station master at Borwick Station, Lancashire. It stands as testimony to the importance of the rural railway station to the life of small communities.

Staffordshire porcelain vase commemorating Rocket, 1800–1900
This spill vase commemorates Stephenson's *Rocket*. This iconic locomotive used Liverpool Road Station in Manchester (now the Museum of Science and Industry) from its opening day on 15 September 1830.

George Fox & Sons Ltd archive, 1880–1922
This collection from Dewsbury-based cotton spinners George Fox & Sons includes photographic prints of textile machinery taken by James Mudd & Sons, which demonstrate Mudd's skills as an industrial photographer.

The Elizabeth Mason Archive
This collection of personal papers and photographs documents Elizabeth Mason's career as a medical photographer in St James' Hospital, Balham, London, from 1949 to 1965. Medical photography is one of the earliest specialised uses of the medium.

WHAT WE LENT OUT

In the past year the Group loaned 2,548 objects to 166 different venues in the UK and 308 objects to another 25 overseas. Here's where 10 ended up.

Railway Queen's velvet gown, 20th century
To: Leeds Industrial Museum, UK
Worn by women elected to represent the railway industry. Lent for the exhibition *Queens of Industry*.

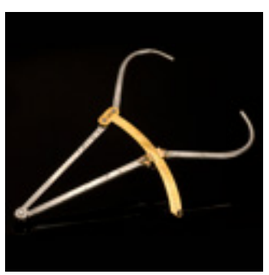
Specimen of mandrake root, 16th–17th century
To: British Library, London, UK
Carved to resemble a human figure. One of several loans for the exhibition *Harry Potter: A History of Magic*.

Bush CTV25 colour television receiver, 1968
To: Wimbledon Lawn Tennis Museum, London
One of five television and broadcast items lent for the exhibition *On Air: Wimbledon and the BBC 1927–2017*.

DNA testing kit, 1999
To: Palazzo delle Esposizioni, Rome, Italy
'SpectroCHIP' made by Sequenom, Inc. Used as part of 'Mass ARRAY' kit by researchers to acquire DNA information.

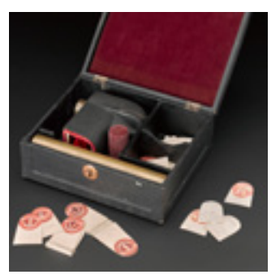
Two clay pipes, about 1850
To: Manchester Museum, UK
These typical archaeological finds from the Industrial Revolution are on long-term display in the museum's *Discovering Archaeology* gallery.

Islamic astrolabe, about 1150
To: Palace Green Library, University of Durham, UK
Originating from North Africa, this planispheric astrolabe was one of a group of objects lent for the exhibition *Time Machines*.



Instrument for measuring the head, 1883–1900
To: Deutsches Hygiene Museum, Dresden, Germany
This 'thickness compass' was used as part of French criminologist Alphonse Bertillon's criminal identification system. Lent for the exhibition *Faces*.

Visit India poster, about 1930
To: Museo d'Arte della Svizzera Italiana, Lugano, Switzerland
One of five Indian State Railways posters lent for the exhibition *On the Paths of Illumination. The Myth of India in Western Culture, 1808–2017*.

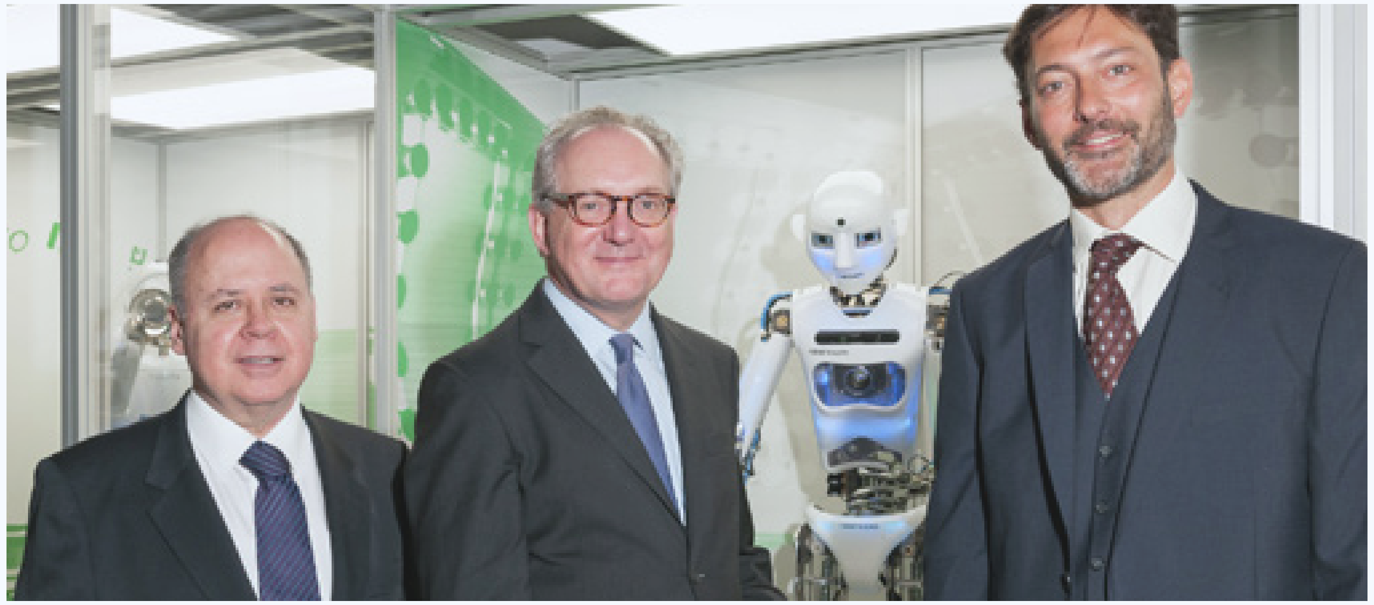


Phantom larynx, 1870–1916
To: Museum of Applied Arts & Sciences, Sydney, Australia
Owned by the physician Sir Thomas Brunton Lauder, and used to teach medical students. Lent to the Wellcome Collection touring exhibition *This is a Voice*.

Decorated pedestal water closet, about 1880
To: Cube Design Museum, Kerkrade, Netherlands
New Humber model, by McDowall, Stevens and Co. Lent for the exhibition *Everything You Always Wanted to Know About Toilets, But Were Afraid to Ask*.

FINANCIAL OVERVIEW: COMMERCIAL AND CULTURAL SUCCESS

By Jonathan Newby, deputy director and Group chief operating officer



Eduardo dos Santos, the Brazilian ambassador, Jonathan Newby, Group deputy director and chief operating officer, and Vijay Rangarajan, ambassador to Brazil

THE YEAR'S HIGHLIGHTS

The Science Museum Group attracted a total of 5,325,000 visits during the past year (+2%). Following a dip in numbers in 2016–17, this year we saw a recovery in visits led by the majority of our Northern sites.

The Science Museum attracted 3,178,000 visits (-1%). This was a positive finish following a challenging start to the year with a number of terrorist incidents seeing visits fall significantly in May and June. The total includes 429,000 visits in education groups, -7%, with terrorism thought to have deterred bookings.

The Museum of Science and Industry attracted 684,000 visits (+6%) aided by the *Robots* exhibition, Soyuz capsule tour and museum-based *Manchester Science Festival* events. This was a strong recovery after the dip experienced in May following the Manchester Arena attack. The total includes 80,000 visits in education groups (+10%).

The National Railway Museum attracted 760,000 visits (+8%), with the arrival of the Soyuz capsule giving a particular boost towards the end of the year. The total includes 41,000 visits in education groups (+6%).

Locomotion attracted 199,000 visits overall (-15%). Performance was behind prior year due to the hugely successful Shildon Shed Bash featuring *Flying Scotsman* in July 2016. This year's total includes 13,000 visits in education groups (+87%) - a new record aided by the Soyuz capsule tour.

Following its relaunch in March 2017 and the opening of *Wonderlab*, the **National Science and Media Museum** attracted 505,000 visits (+25%), including 38,000 visits in education groups, an increase of 12%.

Off-site visits: In total there were 185,000 instances of participation in off-site learning activities delivered across the Group; 108,000 visits to *Flying Scotsman* as it toured heritage railways and provided mainline services and over 650,000 visits to our touring exhibitions – our largest annual attendance since launching the programme in 2014 .

Digital audience: There were 11,585,000 visits to the Group's websites, level with the previous year.

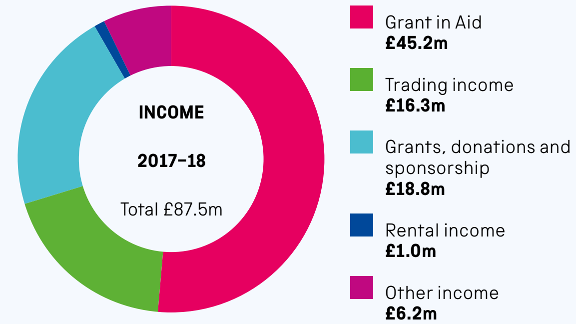
SCIENCE MUSEUM GROUP VISIT NUMBERS 2017–18

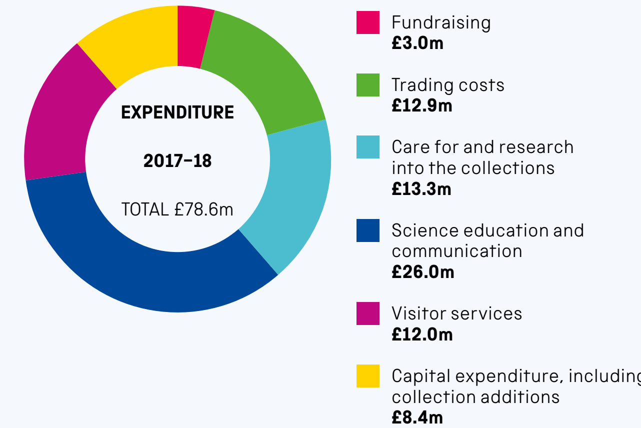
Total number of visits to the museums	London	York	Manchester	Bradford	Locomotion	Group
2016–17	3,219,000	704,000	645,000	405,000	232,000	5,205,000
2017–18	**3,178,000**	**760,000**	**684,000**	**505,000**	**199,000**	**5,325,000**

Visits in education groups	London	York	Manchester	Bradford	Locomotion	Group
2016–17	460,000	39,000	73,000	34,000	7,000	612,000
2017–18	**429,000**	**41,000**	**80,000**	**38,000**	**13,000**	**601,000**

Any anomalies in totals and % differences arise from roundings

SCIENCE MUSEUM GROUP FINANCIAL SUMMARY 2017–18




EXPENDITURE
2017–18
TOTAL £78.6m
Fundraising £3.0m
Trading costs £12.9m
Care for and research into the collections £13.3m
Science education and communication £26.0m
Visitor services £12.0m
Capital expenditure, including collection additions £8.4m

These charts are based on unaudited financial information extracted from management accounts as at 31 March 2018

With the opening of *Wonderlab* and a vibrant new identity, the National Science and Media Museum kicked off 2017–18 for the Group and led the way, ending the year 25% ahead of the previous year's visitor numbers. This focus on our museums outside of London was sustained with the extraordinarily successful tour of Tim Peake's Soyuz capsule, which has landed at each of our museums this year, drawing huge crowds and boosting visitor numbers to end the year 2% ahead of last year for the Group as a whole.

The tour of Soyuz has been a cultural and a commercial success. We are indebted to Samsung, whose sponsorship has enabled us to tour not only the object, but also the accompanying virtual reality experience. The VR experience in London and on tour generated over £300,000 of new income.

At the Science Museum in London, *Wonderlab* was open for its first full year of operation, generating £1.2 million of income and consistently ranking among visitors' favourite things to do at the museum. Our expertise in developing the gallery has extended internationally in 2017–18, with a new collaboration with the Queensland Museum in Australia to help create a similar gallery. This is an exciting commercial opportunity and one which again demonstrates our strategic focus on innovation and diversification of income.

Our *Robots* exhibition ran until September at the Science Museum, generating £900,000 from ticket sales and exceeding visitor expectations. The exhibition then toured to Manchester, where it again exceeded targets, reaching 67,000 visitors – 42% ahead of forecast and our best attendance for a ticketed exhibition at that site.

Our other commercial activity performed well, meeting a budget of £3.2 million profit despite a very difficult start to the year, with visitor numbers dropping for several weeks following the terrorist incidents in London and Manchester. Venue hire for day and evening events was exceptionally strong, generating income of £1 million, 14% ahead of target. Another notable success was our *Power Up* gaming festival, which ran in Manchester in the summer and in London over the October and Easter holidays. Both London festivals sold out – a testament to a very effective email marketing campaign, which demonstrated the transformational effect of our new CRM system.

All this represents a huge amount of hard work and dedication from staff and none of it would be possible without the generous support of our visitors, sponsors and donors. This meant that in 2017-18 Grant-in-Aid represented only 52% of our total income, a further demonstration of our commitment to become more financially sustainable and diversify income streams.

We have had continued success in fundraising this year, including raising significant funds for future capital developments, most notably the £24 million *Medicine Galleries*, due to open in the autumn of 2019.

We are particularly grateful to our visitors, who donated £2.9 million across our museums this year, income that is vital to sustain them in an uncertain funding environment. Whilst our core Grant-in-Aid remained flat this year, it is a cut in real terms. The commercial success of initiatives such as the Soyuz tour and the Queensland consultancy will help us to manage a challenging year ahead, but it is critical that we continue to drive income generation and seek to bear down on operating costs in order to reach a sustainable position in future years.

Managing budgets is particularly challenging due to the investment required in our estate and key infrastructure. During 2017–18 we have made significant improvements in our estates management, which will be an area of priority and ongoing investment. We are very grateful for a DCMS contribution of £1 million additional capital Grant-in-Aid, which will help us to carry out some urgent conservation works at the Museum of Science and Industry.

At the heart of everything lies the care and preservation of our collections and work has continued to move them to the new National Collections Centre in Wroughton. This extraordinary opportunity to document and digitise 320,000 objects and move them to a fit-for-purpose store will lay the foundations for all of our activities for generations to come.

OUR GENEROUS SUPPORTERS

We extend our grateful thanks to all those individuals, families and organisations who supported the work of the Science Museum Group during 2017–18

SCIENCE MUSEUM

Individual philanthropists, trusts, foundations and government
Art Fund
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Arts Council England
Bagri Foundation
Biotechnology and
Biological Sciences Research Council
British Council
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NATIONAL RAILWAY MUSEUM

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Supporters of *Illuminating India*: representatives from the Bagri Foundation, the John S Cohen Foundation and the Helen Hamlyn Trust, with Mary Archer and Ian Blatchford at the launch of the exhibition

SUPPORTING THE SCIENCE MUSEUM GROUP

The financial support of visitors and partners provides critical funding for the museums' core priorities and future plans. We are grateful to all those who have made a donation to the Science Museum Group. There are several ways to become a supporter:

Individual philanthropists and patrons are a part of our Science Museum Group community. They are united by a fascination with science, engineering and technology, in all their forms and for passing on that sense of discovery to wider audiences and future generations. By contributing to the success of future initiatives, they get to know our people, collection and exhibitions better through an exclusive programme of private viewings, behind-the-scenes tours and lectures that explore pressing issues of the moment.

Corporate supporters understand the importance of promoting greater public understanding of the role of science, engineering, and technology in our lives. By joining with us as partners they are able to realise their own business objectives in creative and tangible ways, develop unique employee, customer and stakeholder engagement opportunities, and demonstrate their commitment to addressing urgent challenges of our time.

Trusts, foundations and public sector/ lottery bodies partner us in engaging communities in science and heritage – igniting curiosity, stimulating creativity and inspiring visitors. Our partners share our aims of increasing knowledge and promoting STEM skills and enjoyment. Their support enables us to deliver these aims to millions of people, celebrating the science that surrounds us.

Visitor giving provides an opportunity for everyone to support us as a charity, allowing us to carry out our core work and to invest in our future.

For further information please get in touch with us at: development@sciencemuseum.ac.uk.

WHO'S WHO IN OUR GREAT SCIENCE ALLIANCE

THE SCIENCE MUSEUM GROUP COMPRISES:
Science Museum, London
National Railway Museum, York
Museum of Science and Industry, Manchester
National Science and Media Museum, Bradford
Locomotion, Shildon
SCMG Enterprises Ltd

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The Board of Trustees of the Science Museum is responsible for the whole of the Science Museum Group. The trustees, who may number between 12 and 20, are appointed by and responsible to the Prime Minister through the Department for Culture, Media and Sport (DCMS). The director of the Science Museum Group, as chief executive officer, is responsible to the Board of Trustees: and, as accounting officer, is accountable to DCMS for compliance with the management agreement. Within the framework of their statutory duties as stated under the National Heritage Act 1983, the role of the trustees is to establish group policy, review performance and endorse appointments to key management positions. Their primary activity is to assist the chairman in meeting the board's overall responsibilities, in accordance with the policies of the Secretary of State, and in compliance with charity law. The Board of Trustees also offers guidance and expertise on setting and implementing the strategy for the Group.

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Serving during the financial year April 2017 to April 2018

NEW FELLOWS OF THE SCIENCE MUSEUM

Sir Mark Walport (pictured left) in appreciation of his distinguished contribution to the advancement of science education and research.

HRH Princess Anne in recognition of her great support of women in science and engineering and encouragement of young people to engage further with science, technology, engineering and mathematics.

Dame Margaret Weston in recognition of her dedication to the Science Museum Group both during her time as director and in the years since.

Dr Kartar Lalvani in appreciation of his distinguished contribution to the Science Museum's *Medicine Galleries*.

THE SCIENCE MUSEUM GROUP

The Science Museum Group is devoted to the history and contemporary practice of science, medicine, technology, industry and media. For more than a century we have innovated and developed, becoming the world's most significant museum group for science, technology and engineering, and attracting more than 5 million visits annually

Heritage, mission and objectives
Our collections form an enduring record of scientific, technological and medical change since the 18th century. The Group incorporates the Science Museum, its Library and Archives; the National Railway Museum in York; Locomotion in Shildon; the Museum of Science and Industry in Manchester; and the National Science and Media Museum in Bradford. We have two major collections facilities, the National Collections Centre at Wroughton in Wiltshire and Blythe House in west London.

The Science Museum Group is a non-departmental public body that aspires to the highest international museum standards in the care and preservation of collections, scholarship, programming, learning and advocacy for our subject areas.

Inspiring Futures
In 2017 the Science Museum Group adapted its strategic approach and priorities for the period 2017–30.

Vision – A society that celebrates science, technology and engineering and their impact on our lives, now and in the future.

Mission – We inspire futures by:
- Creative exploration of science, technical innovation and industry, and how these made and still sustain modern society
- Building a scientifically literate society, using the history, present and future of science, technology, medicine, transport and media to grow 'science capital'
- Inspiring the next generations of scientists, inventors and engineers

Strategic priorities – We will:
- Grow 'science capital' in individuals and society
- Grow our audiences and exceed their expectations
- Sustain and grow our world-class collection
- Extend our international reach
- Transform our estate
- Harness the potential of digital
- Increase income

'2018 is the Year of Engineering and where better to launch this government initiative than at the Science Museum, which houses some of the world's most iconic engineering achievements'

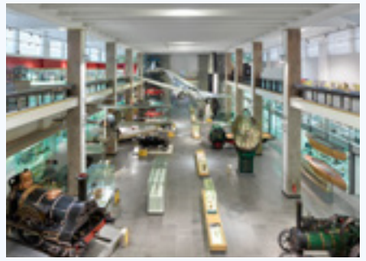
Dr Hayaatun Sillem,
chief executive, Royal Academy of Engineering

THE CHARITY

The Board of Trustees of the Science Museum was established under the National Heritage Act 1983. The Science Museum Group is an exempt charity under the Third Schedule of the Charities Act 2011.

Right: 1970s Super astronaut robot with packaging from Horikawa, Japan

SCIENCE MUSEUM GROUP
LONDON, YORK, MANCHESTER



SCIENCE MUSEUM

Director: Ian Blatchford
Exhibition Road
London SW7 2DD
sciencemuseum.org.uk

Heritage
The Science Museum explores the science, technology, engineering, mathematics and medicine that shapes our lives and traces its origins and the birth of its world-class collection of original artefacts from the Great Exhibition in 1851. Among the key historical exhibits at the museum are Arkwright's prototype spinning machine (1769), Amy Johnson's Gipsy Moth aircraft (1928), Cooke and Wheatstone's telegraph (1837), Alan Turing's Pilot ACE computer (1950) and the Apollo 10 command module that went into lunar orbit in 1969. Our Library and Archives collection includes rare and significant items such as the first printed translation and commentary of Ptolemy's *Almagest* and Charles Babbage's drawings for his calculating machines. The museum has pioneered interactive science interpretation for over 80 years, while the *Tomorrow's World* and *Who Am I*? galleries are flagships for discovering cutting-edge science. The museum attracts over 3.3 million visits annually.

Masterplan
Between 2014 and 2019 over one-third of public space at the Science Museum will have been transformed through the masterplan. An elegant new lecture theatre opened in 2017 and work continues apace to create the exciting new galleries and event spaces that are set to open within the next two years.

NATIONAL RAILWAY MUSEUM

Director: Judith McNicol
Leeman Road
York YO26 4XJ
railwaymuseum.org.uk

Heritage
The National Railway Museum in York houses the world's greatest collection of railway items and objects from the past 200 years. Set in former railway buildings close to York Station, the museum has more than 1 million railway artefacts, including many famous locomotives and an unrivalled collection of royal carriages. The museum is visited by over 760,000 people each year and has a busy programme of exhibitions and events.

Masterplan
The £50 million masterplan will transform the museum to tell the epic story of how railways have shaped our world and to be befitting of the vibrant new neighbourhood that will be created around the museum as part of the York Central redevelopment. The Great Hall will be redisplayed and a *Wonderlab* will be created to inspire young engineers. A new Central Gallery will showcase the latest innovations and technology from the rail industry. York Central is currently at the planning consultation stage, with a planning application timetabled for summer 2018. By 2025, it is hoped that the masterplan will be complete and the transformed museum will be ready to open to celebrate the 200th anniversary of the Stockton & Darlington Railway and the museum's 50th anniversary.

MUSEUM OF SCIENCE AND INDUSTRY

Director: Sally MacDonald
Liverpool Road, Castlefield
Manchester M3 4FP
msimanchester.org.uk

Heritage
The Museum of Science and Industry occupies an important heritage site comprising five listed buildings. As the original terminus of the world's first inter-city railway, our authentic 1830 warehouse and station building epitomise Manchester's 19th-century reputation as 'the warehouse of the western world'. Key objects in the collection include models John Dalton used to demonstrate his atomic theory; the world's only working replica of the Small Scale Experimental Machine, or 'Baby' computer; and a large collection of steam mill engines. We demonstrate spinning and weaving daily on original machines in the *Textiles* gallery.

Masterplan
Work continues on the new special exhibitions gallery, an ambitious project which will provide a venue for world-class contemporary science exhibitions in the Great Western Warehouse. It is planned for completion in 2020 and will help develop our reputation and the city's as a globally significant place for science innovation and understanding.

Above, from the left: *Making the Modern World* gallery at the Science Museum; The Great Hall at the National Railway Museum; the Avro Shackleton plane, affectionately known as 'Dougal' in Manchester; Kodak 2A folding Brownie in Bradford; *Flying Scotsman* and a glimpse of a few of the objects held at the National Collections Centre

SCIENCE MUSEUM GROUP
BRADFORD, SHILDON, WROUGHTON

NATIONAL SCIENCE AND MEDIA MUSEUM

Director: Jo Quinton-Tulloch
Pictureville
Bradford BD1 1NQ
scienceandmediamuseum.org.uk

Heritage
The National Science and Media Museum, in the heart of Bradford, explores the science and culture of image and sound technologies, and their impact on our lives. The museum draws on more than 3 million items of historic significance in its collections of photography, cinematography and television. World firsts include the Leeds-made camera used by Louis Augustin Le Prince in 1888 to make the earliest moving pictures, and Kodak No 1, the American-made camera that enabled mass photography from 1889. Europe's first IMAX theatre opened in the museum in 1983, and our Pictureville cinema boasts the only permanent, regularly programmed Cinerama installation outside the USA.

Masterplan
The *Sound and Vision* galleries – due to open in 2022 – will provide worthy companions to our most recent interactive gallery, *Wonderlab*, which explores the science of light and sound. In the shorter term, this summer's major exhibition *Action Replay* looks at sports broadcasting technology, and the museum-organised Bradford Science Festival, which in 2017 was enjoyed by nearly 35,000 people, returns in July.

LOCOMOTION

Director: Judith McNicol
Dale Road
Shildon DL4 2RE
locomotion.org.uk

Heritage
Locomotion offers visitors the chance to see highlights of the national collection of rail vehicles in Shildon, County Durham – the world's first railway town. The building is home to more than 70 heritage vehicles, including the prototype Deltic, British Rail's Advanced Passenger Train, and the iconic LNER locomotive No. 4771 Green Arrow. Locomotion's workshop carries out a range of restoration projects, which visitors can watch from the purpose-built viewing platform. And the museum hosts a busy programme of events, exhibitions and learning activities – from steam spectaculars to guided tours. On 1 December 2017, Locomotion became a full part of the Science Museum Group – while continuing to benefit enormously from its partnership with Durham County Council, which includes generous financial support.

Masterplan
Locomotion goes from strength to strength. Exciting plans are being developed for the site, including restoration of its historic buildings, promotion of our incredible national collection vehicles, and building on relationships with the local community and our neighbours in the cultural sector.

NATIONAL COLLECTIONS CENTRE

Wroughton SN4 9LT
(Pre-booked research visitors only)

The Science Museum Group's site at Wroughton in Wiltshire was founded in 1979 on a 545-acre former airfield. It houses a superb range of large artefacts – such as the world's first hovercraft and an early robotic arm used in manufacturing – available for both exhibition and research, as well as the Science Museum's Library and Archives. The site is becoming a national hub for collections access and storage, and this year played host to a live BBC television programme, *Britain's Greatest Invention*.

BLYTHE HOUSE COLLECTIONS STORE

Olympia
London W14 0QX
(Pre-booked research visitors only)

Blythe House is shared by the Science Museum, V&A and British Museum for small-object storage. Following the Government's allocation of £150 million for all three museums to relocate, we plan to move out about 320,000 objects to a new building at the National Collections Centre, uniting the Group's collections and improving access. We have installed wireless internet throughout our store rooms, ahead of starting digitisation of the collection before it is moved.

THE WORLD IS OUR OYSTER

Our touring exhibitions are branching out from Britain – to Europe, Asia and Australia

Collider, our exhibition about CERN's Large Hadron Collider and our first exhibition to tour, concluded its journey following its final display in Queensland. Over the life of the tour it was seen by 663,456 people, having been displayed in Paris, Singapore, Hong Kong and two venues in Australia.

Wonder Materials; Graphene and Beyond – the first exhibition from the Museum of Science and Industry to tour – opened at the Hong Kong Science Museum in December. The exhibition was sponsored by the GREAT campaign and in March was the feature exhibition of the GREAT Festival of Innovation attended by Ian Blatchford, the Group director, and other delegates including Liam Fox, Secretary of State for International Trade.

Our four clones of *Beyond the Lab* also continued their European tour to France, Belgium, the Netherlands, Ireland, Estonia, Latvia, Lithuania, Finland, Austria, Hungary, the Czech Republic, Italy, Greece, Malta, Bulgaria and Romania, and have been seen by about a million people.

Left: Opening ceremony of *Wonder Materials* at Hong Kong Science Museum. From the left: the director general of trade and investment at the British Consulate, Paul McComb; the assistant director of leisure and cultural services, Chan Shing-wai; the director of the Museum of Science and Industry, Sally MacDonald; the director of the Hong Kong Science Museum, Karen Sit
Far left: The Soyuz tour of the UK brought Group sites together
Bottom: *3D: Printing the Future* was simultaneously created and shown around the world

Following the launch of the Blueprint Pack programme in 2016/17, this year versions of our exhibition *3D: Printing the Future* were simultaneously created and shown at MAST in Rio, the Franklin Institute in the USA and Transylvania Natural History Museum and Muzeul Casa Muresenilor in Romania. Across the Blueprint Pack sites, it has been seen by over 200,000 people. Blueprint Packs are an innovative way of sharing exhibitions digitally that are sustainable, cost-effective and enable us to work with museums and venues of varying scale and resource.

Closer to home, the national touring programme has gone from strength to strength. London's acclaimed exhibition *Robots: The 500-Year Quest to Make Machines Human* successfully transitioned to the Museum of Science and Industry as the headline to the *Manchester Science Festival*, before embarking on its international tour to a further four venues. *Only in England* has continued to tour to the Bowes Museum, Palace Arts Hub in Redcar, Kirkletham Museum and Time & Tide in Great Yarmouth, seen by over 150,000 people. *Painting Power: The Art of Terence Cuneo* was our contribution to Hull's tenure as UK City of Culture and brought an extensive collection together for the first time.

The UK tour of Tim Peake's Soyuz space capsule and VR experience brought Group sites and national institutions together, with appearances by Tim Peake and an immersive outreach bus inspiring a generation of schoolchildren across the country. After two sites it had been seen by over 130,000 people in Bradford and Shildon and we look forward to it landing at the competition venue, in a less traditional environment at Peterborough Cathedral.

Looking ahead, we have some exciting additions to our touring portfolio, currently in development with Exhibitions team, so the next year will offer the opportunity to develop many more international partnerships for the Group.

TERENCE CUNEO: A FIRST-CLASS PAINTER

A partnership between the National Railway Museum and Science Museum paid tribute to one of the finest railway artists – and was a coup for Hull

Visitors to the Hull City of Culture 2017 were treated to a landmark exhibition of works by the artist Terence Cuneo, thanks to a unique partnership between the National Railway Museum and the Science Museum.

Originally taking inspiration from Cuneo's painting of the Queen's visit to Hull in 1957, the exhibition *Painting Power: The Art of Terence Cuneo* opened on 13 December 2017 at the University of Hull.

The exhibition featured 36 drawings and paintings, many of which have never been on public display before and was curated by the Science Museum Group's director, Ian Blatchford, and the National Railway Museum's assistant director and head curator, Andrew McLean.

Drawing on extraordinary loan material from across the UK to supplement the Group's rich collection, the exhibition included rare works such as Cuneo's private tribute *The Lying In State of Sir Winston Churchill* and the first of his railway paintings, *Giants Refreshed*.

Terence Cuneo produced almost 6,000 paintings throughout his career and is widely considered to have been one of the world's finest railway artists. From 1953, Cuneo painted a mouse into each of his works and visitors spent many an hour searching for tiny murine features.

Andrew McLean said: 'We are fortunate to have a large collection of works by Terence Cuneo, some of which were commissioned and painted on-site at the Science Museum. *Waterloo* (see above), arguably one of Cuneo's most famous paintings, now takes pride of place on display at the National Railway Museum in York.

'Cuneo documented many of the important moments of the last century and his work has a broad and lasting appeal. I am honoured to co-curate this exhibition and to be involved in celebrating Hull UK City of Culture 2017.'

'Cuneo documented many of the important moments of the last century and his work has a broad and lasting appeal'

Andrew McLean, assistant director, National Railway Museum

Above: Waterloo Station (1967)

Right: Terence Cuneo was a war artist in the Second World War

Below: Ian Blatchford, who co-curated the exhibition, with the artist's daughter Carole

NATIONAL RAILWAY MUSEUM

FULL SPEED AHEAD

The beautiful new brand sweeping its way across the Science Museum Group is giving each of our museums an opportunity to think again about the face they present to the world.

The campaign to relaunch the National Railway Museum brings to life the faces of locomotives from a range of eras, reflecting director Judith McNicol's ambition to inspire visitors with the past, present and future of rail and engineering. At once welcoming and elegant, the images have already proved a hit with visitors.

The campaign was developed by North, the award-winning design company behind our new visual identity and shot by photographer Lee Mawdsley. As with much of the imagery commissioned for the rebrand, the campaign brings a fresh perspective to well-known locomotives such as Mallard and Deltic (pictured above), celebrating our objects' intricate beauty. By the autumn all our museums will be recognisable as part of the Science Museum Group as the new brand reaches Manchester, a moment that will be heralded by the arrival in the birthplace of the industrial revolution of another rail icon – Stephenson's *Rocket* – and a new name, the Science and Industry Museum.

BULLET

MALLARD

LODE STAR

DUCHESS OF HAMILTON

'The National Railway Museum is best placed to showcase both the historical and contemporary advances in railways'

Sir Peter Hendy, chairman of Network Rail

EUROSTAR

WESTERN

COPPERNOB