SCIENCE MUSEUM GROUP

OPENING MINDS SECURING OUR FUTURES

ANNUAL REVIEW 2012–13

SMG INFLUENCE AROUND THE GLOBE 2012–13

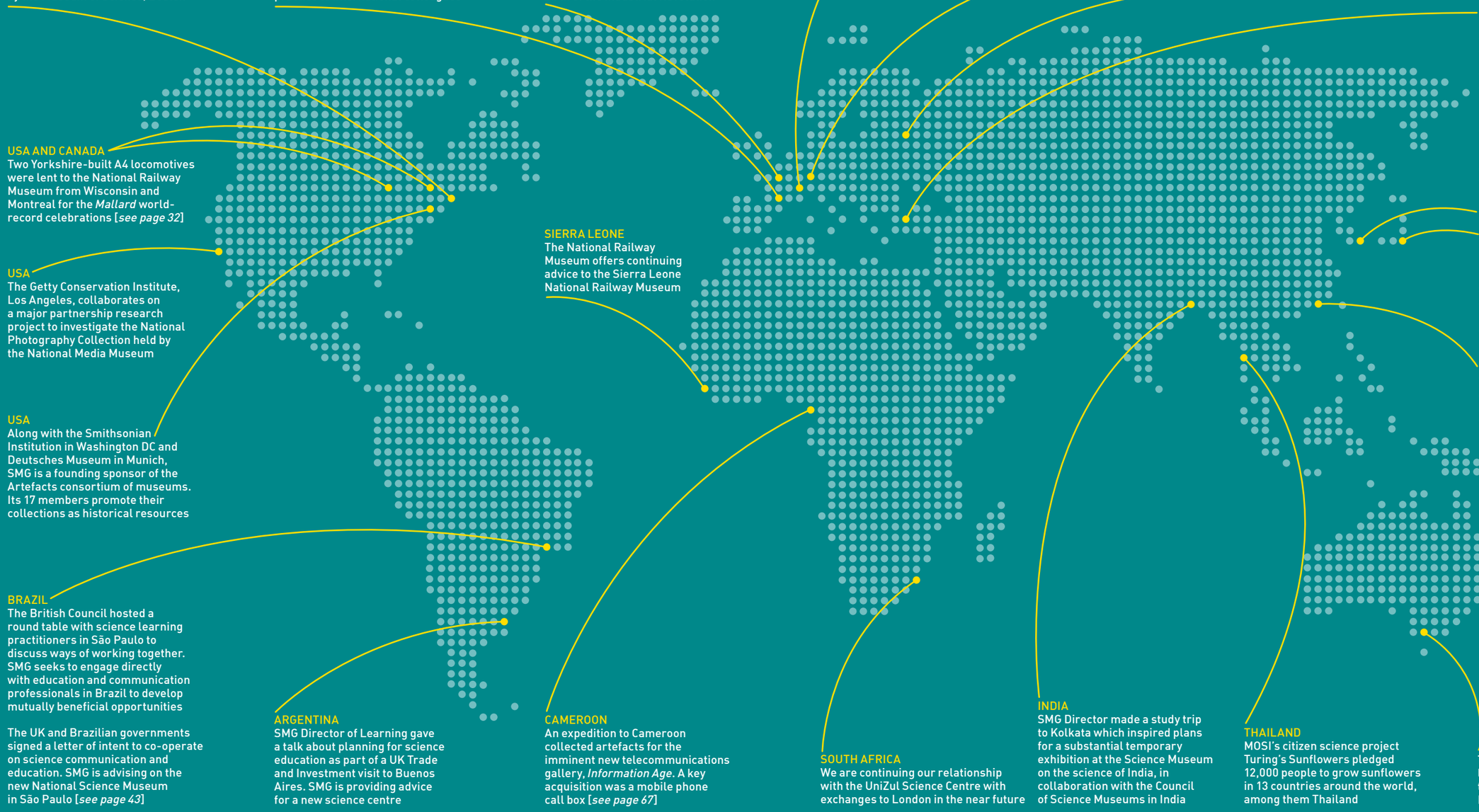
> The Brazilian Government's request for advice from the Science Museum on the development of a new national science museum for Brazil, demonstrates the Museum's world-leading reputation and I wish the venture every success
>
> **DAVID WILLETTS** UK SCIENCE MINISTER

SELECTED ENTERPRISE ACTIVITY

Australia
Belgium
Brazil
Canada
Cyprus
Czech Republic
Denmark
France
Germany
Greece
Israel
Italy
Japan
Mexico
Poland
Russia
South Korea
Spain
Sweden
Turkey
Ukraine
USA

OUR COLLECTIONS ON LOAN ACROSS THE WORLD

Australia
Austria
Belgium
Canada
France
Germany
Hungary
India
Ireland
Italy
Netherlands
Norway
Spain
USA



USA
The Science Museum is part of the NISEnet (Nanoscale Informal Science Education Network), a collaboration between museums, science centres and universities founded in 2005 by the NSF (National Science Foundation) and currently led by the Museum of Science, Boston

FRANCE
Science Museum staff from the Learning, Contemporary Science and Audience Research teams attended the Ecsite Annual Conference in Toulouse and delivered talks on our live projects, partnerships and innovative learning practice to international colleagues

FRANCE
Among hundreds of items lent from SMG collections, the painting *Coalbrookdale* by Night (1801) went to a Strasbourg retrospective of Philippe Jacques de Loutherbourg. Its glowing furnaces symbolise the birth of the Industrial Revolution

SWITZERLAND
After close collaboration with CERN the Science Museum is due to open *Collider*, a multimedia exhibition about the Large Hadron Collider, in November 2013. This will later tour the world

GERMANY
The Deutsches Museum is a co-partner with SMG in the EU CEO Thinktank of seven public science museums in Europe (Belgium, France, Italy and UK)

RUSSIA
SMG Director visited Russia to discuss potential partnerships for 2014's UK-Russia Year of Culture when the Science Museum aims to launch *Cosmonauts*, a major exhibition about Russia's exploration of space

TURKEY
SMG began a partnership with Santralistanbul to deliver an education training programme in Istanbul and London. Our Mystery Box project in Turkey opened the door for further collaboration [*see page 28*]

SOUTH KOREA
A training course for 30 Korean teachers was held at the Science Museum. We also welcomed a curator from the National Science Museum of Korea for six months' study after being awarded the Korean Government Overseas Fellowship. Senior members of our Learning team attended the KOFAC STEAM conference in Seoul, promoting creativity in science education

JAPAN
NRM York cemented a relationship with the Railway Museum in Saitama, Japan (we signed a sisterhood agreement) and with Umekoji Steam Locomotive Museum, Kyoto and the Modern Transportation Museum, Osaka

CHINA
The SMG Learning team delivered science shows to audiences of 7000 people at the Science Alive festival in Hong Kong and southern China

USA AND CANADA
Two Yorkshire-built A4 locomotives were lent to the National Railway Museum from Wisconsin and Montreal for the *Mallard* world-record celebrations [*see page 32*]

USA
The Getty Conservation Institute, Los Angeles, collaborates on a major partnership research project to investigate the National Photography Collection held by the National Media Museum

USA
Along with the Smithsonian Institution in Washington DC and Deutsches Museum in Munich, SMG is a founding sponsor of the Artefacts consortium of museums. Its 17 members promote their collections as historical resources

BRAZIL
The British Council hosted a round table with science learning practitioners in São Paulo to discuss ways of working together. SMG seeks to engage directly with education and communication professionals in Brazil to develop mutually beneficial opportunities

The UK and Brazilian governments signed a letter of intent to co-operate on science communication and education. SMG is advising on the new National Science Museum in São Paulo [*see page 43*]

ARGENTINA
SMG Director of Learning gave a talk about planning for science education as part of a UK Trade and Investment visit to Buenos Aires. SMG is providing advice for a new science centre

SIERRA LEONE
The National Railway Museum offers continuing advice to the Sierra Leone National Railway Museum

CAMEROON
An expedition to Cameroon collected artefacts for the imminent new telecommunications gallery, *Information Age*. A key acquisition was a mobile phone call box [*see page 67*]

SOUTH AFRICA
We are continuing our relationship with the UniZul Science Centre with exchanges to London in the near future

INDIA
SMG Director made a study trip to Kolkata which inspired plans for a substantial temporary exhibition at the Science Museum on the science of India, in collaboration with the Council of Science Museums in India

THAILAND
MOSI's citizen science project Turing's Sunflowers pledged 12,000 people to grow sunflowers in 13 countries around the world, among them Thailand

AUSTRALIA
The National Media Museum lent iconic cinematography items to the Australian Centre for the Moving Image, Melbourne

LIFT HERE

THE BIGGEST MUSEUM ALLIANCE IN SCIENCE

Dr Douglas Gurr, Chairman of the Science Museum Group, welcomes the warm reception that has greeted our new ambitions during 2012–13 and the energy that drives them

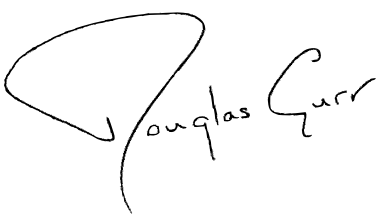
Last year we decided to publish an Annual Review for the first time in many years to reflect the extraordinary creativity of the Group. We felt that our Museums were hiding their light under several bushels and that such a document would make us more accountable and aid us in raising the resources needed to meet our ambitions. Happily, the response to this experiment from decision-makers was impressively positive. Many were surprised by our nationwide reach across five sites – in London, Manchester, York, Bradford and Shildon – as well as the breathtaking diversity of our work and our global aspirations.

We also received a warm response to the publication of Strategic Ambitions, in which the Science Museum outlined its priorities until 2022: climate science and sustainability; the history and future of medicine; mathematics and informatics (including the science of data); and understanding the universe.

This Group is now the biggest alliance of science museums in the world. The past year saw 5.1 million visits to our Museums and, just as important, the surge to more than 20 million visits online. The Science Museum alone achieved a record 3.1 million visits and a rise to 14 million online. We have also grown our independent adult audience while looking after 600,000 booked educational visits, which is so important when it comes to inspiring the next generation of scientists and engineers who will drive the economy. We hope that, one day, every British schoolchild will pass through one of our Museums.

This Review is brimming with interesting stories that convey the innovative spirit of the Group, from the discovery of the world's oldest colour cine film at the National Media Museum, to the Manchester Science Festival organised by the Museum of Science & Industry, Railfest at the National Railway Museum, and our partnership agreement with Brazil.

These achievements are all the more impressive when you realise that our Government funding support will soon have fallen by one quarter in real terms over five years, more than double the reduction endured by the science base. Yet I remain confident that, thanks to the drive and energy of Director Ian Blatchford, we can expect the impact and stature of the Group to continue to grow in years to come.



CONTENTS

SMG ANNUAL REVIEW 2012–13

I am amazed at the Group's ability to keep faith with the serious purposes and remits of the variety of museums under its charge whilst increasing visit numbers. Squaring this circle while having to cut our costs is the challenge ahead

LORD GRADE SMG TRUSTEE, NATIONAL MEDIA MUSEUM ADVISORY BOARD

The Science Museum is exploring new ways to bring the theatre and drama of cutting-edge physics to the public

PROFESSOR ROLF-DIETER HEUER DIRECTOR GENERAL OF CERN

PARTNERSHIP WORKING IS OUR DEFAULT SETTING, IT MAXIMISES IMPACT AND SECURES REAL VALUE

Ian Blatchford, Director and Chief Executive of the Science Museum Group, believes that investing in robust collaborations is the way to ensure science and engineering play central roles in generating prosperity

Last year I declared that it was time for the Science Museum Group to punch its weight, because the nation's future prosperity and quality of life depend on an urgent commitment to science and engineering. One year on, the Group feels like a vital player in science engagement and inspiration. We do not have all the solutions, but we are a major national force and will have the greatest impact through partnerships, internationalism and doing work of real substance.

Partnership working is our default setting. It maximises impact and secures real value for money, and ought to be the best show in town. I am often driven to intense irritation by a national landscape blasted by too many initiatives of scant value; too many public bodies, learned societies and companies ploughing on regardless of what others are doing; and a dreadful dearth of good evidence about what works. Goodness knows what the schoolchildren and adults of Britain are supposed to make of this blizzard. That is why we have vowed to work with the best national partners. Waffle about synergy has become hackneyed, so I prefer to talk about amplification. Strong partnerships mean that the great organisations work together to increase signal strength.

There are many examples in this Review of working with the best. Such as the way the Group led a unique collaboration with the GREAT campaign (based at 10 Downing Street), the Department of Business Innovation and Skills (with whom we mounted the *Make it in Great Britain* exhibition), The Royal Society, Royal Academy of Engineering, Engineering UK and the British Science Association to organise a vote for the greatest British innovations, which has left a legacy in the form of a website now in use by GREAT worldwide.

Partnerships with outstanding arts organisations will bring new audiences to science. The Science Museum hosted *Universe of Sound*, the Philharmonia Orchestra's daring digital installation, in which visitors could conduct a virtual symphony orchestra, and experience performing Holst's *The Planets* under the baton of Esa-Pekka Salonen. Both the orchestra and Museum fundraising teams collaborated to secure the funding for the project (the kind of cooperation still too rare in the cultural sector) and the project won the Audience and Engagement prize at the Royal Philharmonic Society Music Awards.

Director Ian Blatchford showing Brazilian President Dilma Rousseff the *Codebreaker* exhibition

Interesting young people in careers in engineering has also been a crucial theme over the past year. Our *High Performance* festival brought together women engineers from many manufacturing and industry backgrounds, to offer a surprising insight into inspiring working lives, and encourage more young women to think about these options. Building on this, we are working with the Royal Academy of Engineering, National Grid and many major companies to create a provocative exhibition in London and at the Museum of Science & Industry in Manchester about modern engineering careers.

Our impressive education work has been boosted by partnerships with BP and the BG Group. Not only will this expand our outreach work across the country, but both companies are taking a long-term view about impact. They share our regret about the scarcity of good academic research into educational practice, and are sponsoring new research with two universities. The Group is also working for the first time with the Prince's Trust after pop star will.i.am urged us to team up; and he launched the project with a passionate plea for disadvantaged children to have access to STEM subjects.

Our new relish for international cooperation brings the best science and engineering to our audiences, and promotes British science and expertise. We are working with the Brazilian government to create a science museum in São Paulo and, just as important, getting their perspective on the science of sustainability. Our Learning team worked with science and cultural foundations in South Africa, South Korea and Turkey; and the National Railway Museum signed a prestigious agreement with the Railway Museum in Saitama, Tokyo and the East Japan Railways Culture Foundation. The National Media Museum in Bradford made worldwide headlines by announcing the discovery of the world's oldest moving colour pictures.

Above all we pledged ourselves anew to academic and scientific substance. There could be no better symbol than mounting *Codebreaker: Alan Turing's Life and Legacy*, marking the centenary of the birth of the great mathematician and computer pioneer. It tackled his achievements and personal life with such intelligence and verve.

The Group is getting its message across loud and clear.

A BRAVE STAND ON TURING

One event symbolises the Group's new approach: the exhibition marking the birth centenary of Alan Turing, the British code-breaker, mathematician and computer pioneer who helped shorten the Second World War

CONTINUED

Viewing wreckage of Comet G-ALYP at the *Codebreaker* exhibition: Curator David Rooney, Lord Grade, Baroness Northover, Lord Smith, Viscount Montgomery, Lord Harris, Baroness Jones, Lord Dobbs and Baroness Trumpington who lost friends aboard the doomed jetliner

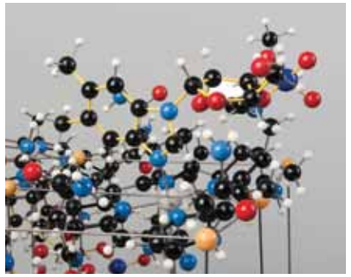
A BRAVE STAND ON TURING

Jean Campbell-Harris was 18 when she went to work in naval intelligence at Bletchley Park, the country house secretly assigned to breaking enemy codes during the Second World War when U-boats were sinking Merchant Navy ships which were keeping Britain alive. 'The two major historical events of the 20th century that took place at Bletchley were the development of the science of cryptology and the first digital electronic computer,' she says.

'I was a cipher clerk in a team of six. Yes, we were aware of the enormity of what we did. Germany could have starved Britain within two years and won the war. But the German U-boat code was broken.'

The specific triumph of cracking the Enigma machine codes served to shorten the war, yet was not disclosed until the 1970s. And the British genius responsible – Alan Turing, mathematician, computer pioneer and philosopher who asked 'Can machines think?' – was long dead by then.

When the Science Museum celebrated the centenary of his birth with the *Codebreaker* exhibition last summer,



CASTING MYSELF IN TURING'S FRAME OF MIND

Why did Alan Turing apparently take his own life at the age of 41 after arrest and chemical castration, while in the midst of important work? David Rooney, curator of the *Codebreaker* exhibition, believes we can understand Turing only by examining his life as a homosexual man in the mid 20th century and why he admitted his 'crime' so readily. Rooney invited 15 members of the charity group Opening Doors London to discuss the prejudice facing gay adults in the 1950s. He says: 'Their heartbreaking experiences made the exhibition materially different because it gave us the confidence to present Turing's life without flinching.'

Opposite: Conservator Bryony Finn readying the Pilot ACE computer for the *Codebreaker* exhibition; bottles of Stilboestrol tablets used for chemical castration; Dorothy Hodgkin's model for vitamin B12, facilitated by high-speed computation

This page: View of the *Codebreaker* gallery; Mick Jagger's Enigma machine; and Alan Turing himself, who asked 'Can machines think?'

Jean, the former cipher clerk, revisited her wartime memories among a group of peers as guests of the Director. Now Baroness Trumpington, she says: 'When I went to Bletchley there were 400 people there; when I left there were 6000.'

The peers moved through the intensely affecting displays of Enigma machines, personal effects and other scientific breakthroughs accelerated by the calculating power of the Pilot ACE, one of the world's first 'universal' electronic computers devised by Turing in 1945. Even more poignant was wreckage from the world's first jet airliner. In 1954, Baroness Trumpington had lost two friends who were on their honeymoon when Comet G-ALYP crashed, the very jet from which the Museum's fragment comes. Again, it was high-speed analysis by the Pilot ACE that helped reveal metal fatigue as the cause. This computer, donated to the Science Museum, remains the most significant Turing artefact in existence.

> "I am indecently proud of the way curators and designers tackled his scientific achievements and complex personal life with such intelligence and verve
>
> **IAN BLATCHFORD** SMG DIRECTOR

Codebreaker's absorbing and personal milestones confirm the new direction the Science Museum Group determined to set last year by reassembling James Watt's workshop: a scholarly assessment of key artefacts from our own collections, combined with insights into the complex life of an exceptional scientist who shaped the modern world.

The tragedy surrounding Turing's death, precipitated by the law's ruling on his homosexuality, is examined frankly here. This sophisticated slice of history has won the highly prestigious Great Exhibitions prize from the British Society for the History of Science. It also prompted several complaint letters wondering why the exhibition was not even larger.

Cine film of Edward Turner's children in about 1901, discovered in the National Media Museum archives by Michael Harvey, Curator of Cinematography [*far right*]

UNEARTHED: MOVIE GEMS IN OUR VAULTS

Curators discovered the world's first moving pictures in colour at the National Media Museum and made international headlines

Watch the Lee and Turner footage in a documentary clip on YouTube:
youtu.be/XekGVQM33ao

'Renewed dedication to our collections and research means a treasure hunt has only just begun,' declares Group Director Ian Blatchford. Few museums know precisely what lies buried in their stores and the SMG possesses more than 7 million objects. Over the decades the National Media Museum has received many profoundly important donations which represent the dawn of photography and cinema and individual pioneers in both media. Quality, depth and prestige make the collections unique in the world and only the curiosity and diligence of curatorial staff will unearth the hidden gems.

Head of Museum, Jo Quinton-Tulloch, says: 'The Museum attracted international attention when it revealed the discovery of the earliest colour moving pictures – the Lee and Turner film, part of the National Cinematography Collection. Its significance became clear only when researchers digitised the frames, revealing vivid moving colour images created in 1901 and rewriting the history of cinema.'

On discovering the film, Michael Harvey, Curator of Cinematography at the Bradford museum, worked with film archive experts Brian Pritchard, David Cleveland and the BFI National Archive to reconstruct the moving footage in colour following the precise method laid out in Lee and Turner's 1899 patent.

Michael Harvey said: 'We sat in the editing suite entranced as full-colour shots made 110 years ago came to life on the screen. The image of the goldfish was stunning: its colours were so lifelike and subtle. Then there was a macaw with brilliantly coloured plumage, a brief glimpse of soldiers marching and, most interestingly, young children dressed in Edwardian finery.

'Lee and Turner's complex three-colour process had always been regarded by film historians as a practical failure, but we now discovered that it worked.'

Paul Goodman, Head of Collections and Projects at the National Media Museum, said: 'This wonderful rediscovery highlights the untapped potential of the Museum's collection, as well as its leading role in validating and challenging received wisdom about the subject matter.'

"Beautiful, amazing, probably the closest thing we'll get to a time machine going back in time

MARTIN SCORSESE
OSCAR-WINNING DIRECTOR AND FILM HISTORIAN

STAR TURNS IN PHOTOGRAPHY

"Lee and Turner redefine where cinematography had got to... a truly, truly amazing image

LORD PUTTNAM
FILM PRODUCER AND EDUCATOR

The first solo exhibition of Tom Wood's photographs celebrated the pleasures of photography and his diary-like fascination with people encountered on the streets, in pubs [*left*], markets, work places and parks of Merseyside. Eighty of his vintage prints were acquired for the Museum, one of the largest acquisitions from a living photographer.

Art of Arrangement: Photography and the Still Life Tradition was a beautiful show comparing themes in early photographs drawn from the Museum's collection alongside oil paintings from Leeds Museums.

A tarantula poised on a vial for extraction of its venom as a superdrug: displayed at the *Pain Less* exhibition on the future of pain relief

‘PAIN LESS’ A FLAGSHIP FOR ANTENNA

Our Contemporary Science team not only mount topical displays such as Pain Less, reporting on the latest advances. They also invite university researchers into the Museum to enlist visitors as massive data sets

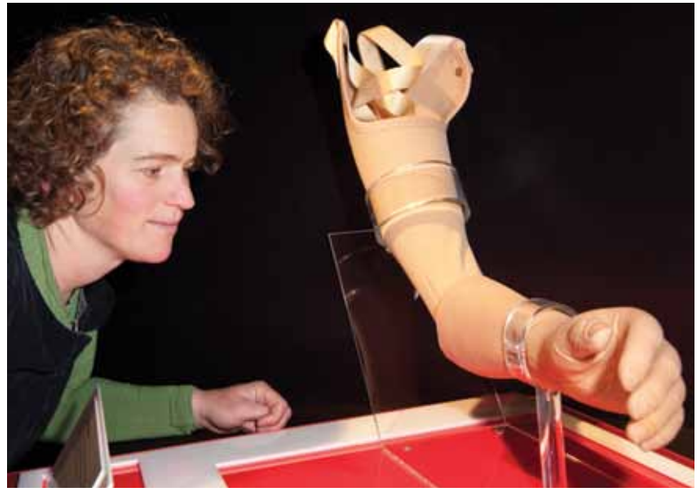
LIFT HERE

‘PAIN LESS’ A FLAGSHIP FOR ANTENNA

***Pain Less* at the Science Museum… Anticlockwise:** Showing how a spider is ‘milked’… On video, anaesthetist Dr Andrew Morley discusses the effects of sedation with patient Carol Pretorius… Student Melvin volunteered to suffer pain for a brain imaging study… *Fragmented Lines*, a film co-created by adults living with pain… Virtual-reality games explored creating a moving virtual arm to help relieve pain

STEP UP AND CHAT

Katrina Nilsson is extremely proud that the Contemporary Science team made ours the first Museum to buy its own Talkaoke, a doughnut-shaped desk with a scientist trained to facilitate in the middle of an intimate circle of visitors on bar stools asking questions. ‘It attracts crowds like a homing beacon,’ she says. ‘It’s a live chat show.’



The sheer energy and research resulting from the Contemporary Science department’s main output is breathtaking in the Wellcome Wing of the Science Museum. The past year yielded 27 major outcomes – ten updates to *Topic Zones* (new exhibits, one of which examined prosthetic limbs for Paralympians), seven *Antenna Live* events (scientists on-site with their kit, say, letting children shake hands with a robot octopus while parents quizzed its inventors), four *Live Science* experiments in residence such as *Listen Up!* [*see box, right*], three updates to *Who am I?* (the biomedical gallery, where the Bionic Man was displayed), two festivals including *High Performance* [*see page 42*] – oh, and a prestige feature exhibition, *Pain Less*.

Not to mention sundry forums in the Dana Centre and a highly responsive website. Oh, and organising communication skills training for 16 engineers who were involved in the Summer of Sport. Their verdict: ‘We didn’t realise engaging with the public could be so informal!’

By museum standards, the Contemporary team moves fast when tackling zeitgeisty issues – deconstructing the Higgs boson triumph at CERN, say. Even a feature exhibition can be researched and on the floor within nine months. A proposal to explore anaesthesia, where there’s little fresh research, was refocused into a survey of pain and consciousness, where there’s much more.

Clockwise from right: Researching *What Makes Your Walk Unique?* as part of *Live Science… Listen Up!* studied how people hear speech… *Antenna* website… Bionic Man, assembled by Darlow Smithson Productions… Richard Bosner demonstrating Octobot

> **ZombieLab sounds like 'science lite', but here were real robust scientific experiments happening on the floor of the Science Museum**

EMILY SCOTT-DEARING
HEAD OF EXHIBITIONS AND PROGRAMMES

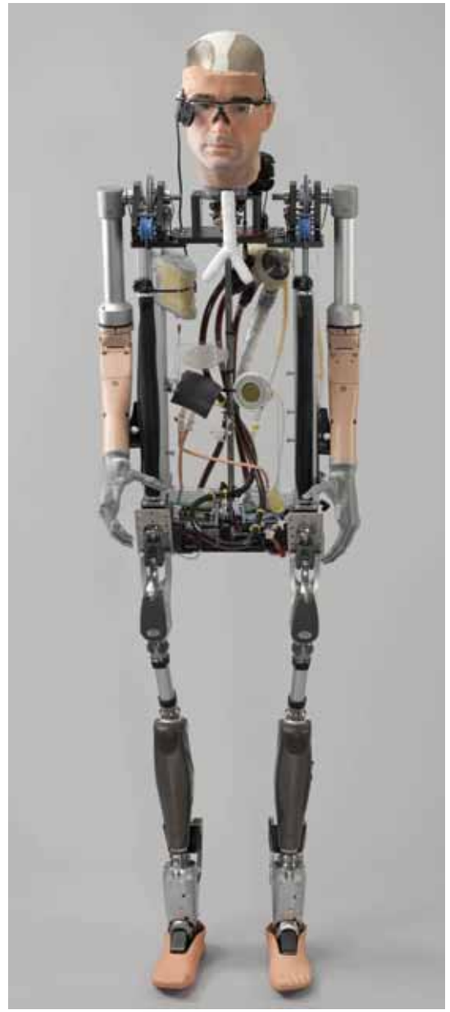
Pain Less resulted: a difficult subject was scrutinised with profound intelligence and input from chronic pain sufferers who contributed a visual artwork, and Year 9 students who created a game on the theme of pain. Most affecting were four documentary videos produced in-house to tell personal stories and to show techniques in research and pain treatments. For Heather Mayfield, Deputy Director of the Museum, *Pain Less* proved to be, 'a considered amalgamation of co-creation, anaesthetists and contemporary research'.

'The research was the easy part; running the co-creation groups was a steep learning curve,' said Katrina Nilsson, Head of Contemporary Science. 'We're always keen to repurpose invested effort for different audiences, so out of the consciousness research for *Pain Less* sprang ZombieLab.' This long weekend festival, which embraced a Lates Wednesday, brought in 12,000 young adults! Researchers from the Sackler Centre for Consciousness Science, Cambridge, UCL and Essex universities dived in to collaborate.

Nilsson said: '*Antenna* is a kind of translation service to make science accessible and the zombies were a hook. Even when we created experiences, as we did in ZombieLab involving arts collectives, we embed real science into them and you'd never call it dumbing down. That's what makes us special.' From Washington DC, the Smithsonian tweeted: 'Why don't *we* do stuff like this?'

BE A GUINEA PIG

Live Science is a pod for hosting live experiments in the Wellcome Trust's *Who am I?* gallery: here Oxford Brookes University identified the characteristics of a person's walk… Queen Mary psychologists played the ultimate game of greed to test human empathy… Cambridge University's *Listen Up!* measured how people hear and understand speech at different ages.



RAILFEST CREATES NETWORKING LANDMARK

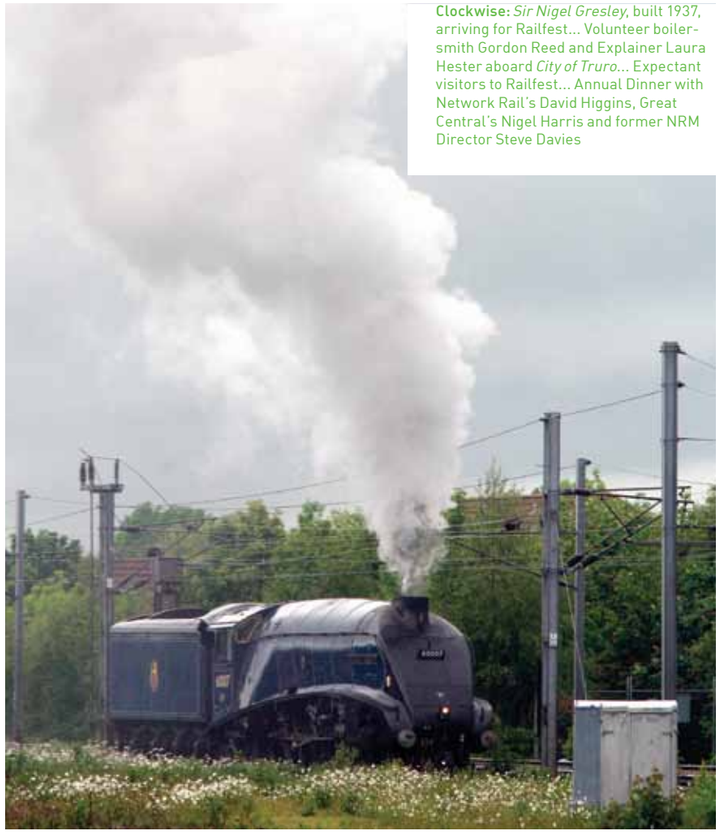
A who's who of Britain's rail industry came to York to celebrate a new golden age of rail

Diabolical rain did not deter 34,000 people from visiting the National Railway Museum during Railfest, Britain's biggest ever gathering of rail record-breakers. The nine-day event in York last summer embraced the *Track Stars* exhibition which united 30 renowned railway vehicles such as *Flying Scotsman*, *Mallard*, a high-speed Class 395, East Coast's 91110 and *Tornado*. A team of 150 volunteers worked more than 5000 hours during the festival to explain the importance of the rolling stock to visitors and to facilitate access to cabs and carriage interiors. Even on the preview day, when the sun was shining, VIPs saw the project for the logistical triumph it was.

This was no sentimental celebration of a bygone age of steam, for Railfest signalled a transport renaissance. A remarkable dinner sponsored by Eversholt Rail, Network Rail and Siemens gathered top brass from the rail industry, heritage and tourism sectors.

Addressing key representatives of rail engineering and operating companies – from Arriva and Abellio to Northern, Systra and the Tyseley Locomotive Works – the after-dinner speaker, Sir David Higgins, Chief Executive of Network Rail, declared: 'We really are in a golden age, and should make the most of it.'

During the past year NRM's Director Steve Davies was succeeded by Paul Kirkman who announced a Masterplan



Clockwise: *Sir Nigel Gresley*, built 1937, arriving for Railfest... Volunteer boiler-smith Gordon Reed and Explainer Laura Hester aboard *City of Truro*... Expectant visitors to Railfest... Annual Dinner with Network Rail's David Higgins, Great Central's Nigel Harris and former NRM Director Steve Davies

> The National Railway Museum is the world's premier museum in its field. We may be based in York and Shildon but our reach embraces the modern rail industry and partnerships across the globe
>
> **PAUL KIRKMAN** NRM DIRECTOR

to examine development of the Museum over the next decade. He says: 'We have appointed the exhibition designers Metaphor to provide a fresh set of eyes and a blueprint that challenges how the organisation thinks. For instance, it will allow for increased vehicle access and better integration of smaller objects within the Great Hall.

'The Museum remains a key part of York tourism, with 59% of our general admissions coming from outside the region. The visitor's experience can only grow richer than ever.'

OTHER NRM HIGHLIGHTS

The Royal Scot class steam locomotive *Scots Guardsman* carried the Olympic flame from the Museum in York to Thirsk as part of the Olympic Torch relay and then continued to NRM Shildon.

In December we cemented our relationship with the Railway Museum in Saitama, Japan, with the signing of a sisterhood agreement between the two museums.

The Tornado Story is an exhibition at Shildon exploring the building of Britain's newest main-line steam locomotive, Peppercorn Class A1 *Tornado*.

Two North American A4s were welcomed by 8000 visitors at Shildon, ahead of *Mallard* celebrations in the summer of 2013 [*see page 32*].

CHIMING WITH HUMAN INGENUITY

Enter *Web Lab*, a series of interactive experiments devised by Google that reveal the workings of the internet in both the real and virtual worlds

The interactive *Web Lab* was designed by Google, the search giant, to showcase the modern web experience. Its USP 'chimes with human ingenuity' by creating a physical exhibition that explores the connection between Science Museum visitors in the gallery and online users anywhere in the world via a website, and so form a global community. Within six months, 4.5 million people had visited online, plus 200,000 in the flesh, and *Web Lab* has won awards from SXSW, AAM Media & Technology and was a Webby Honoree.

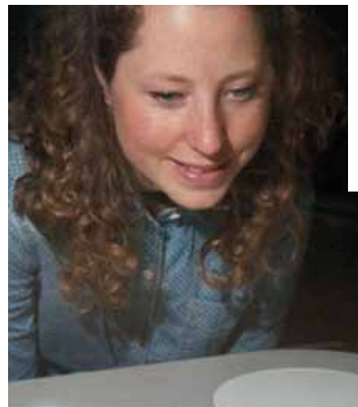
The exhibition is for children aged 8–14 accompanied by parents or teachers to understand how data flows across frontiers. They can even compose and play music, exploiting both the internet and the World Wide Web. Rather amazingly, visitors from across the planet can also participate online at chromeweblab.com.

Connecting visitors with a global web community: the Universal Orchestra [*left*], the Teleporter live stream [*below*] and Sketchbot [*below right*]

WEB FACTOIDS

A follow-up Science Museum survey to *Web Lab* found that 8 out of 10 young people 'feel lost' without the internet, while 40% of people have taught themselves to cook using the web. One in three people surveyed would choose the internet over television, with 60% describing the internet as one of the most important inventions of the 20th century.

> **It's wonderful to follow the constant evolution and rejuvenation of exhibits and whole galleries, with exciting developments and frequent changes**
>
> **PROFESSOR DAME ATHENE DONALD**
> UNIVERSITY OF CAMBRIDGE, SMG TRUSTEE



Web Lab's five unique, continuous web-based experiments have been improved over the exhibition's year of life. They are the Data Tracer image search, the Lab Tag Explorer, the Universal Orchestra (demonstrating how web sockets enable two-way communication), the Teleporter live stream (showing compression can transmit large amounts of data), and arguably the favourite for many visitors, the Sketchbot that can draw your face in sand (showing how the web uses computer languages to tell machines what to do).

SMG Director Ian Blatchford says: 'Our adventurous collaboration with Google produces a brilliant physical realisation of how the internet works and shapes our lives. It is a visual feast, insightful and fun.'

Clockwise from left:
Gina Czarnecki's *Wasted Works*... Planting sunflower seeds for the Citizen Science experiment... Matt Parker's domino computer... Punk Science stand-ups... Professor Helen Storey and the *Field of Jeans*

> **The SMG does a fantastic and really important job in communicating science. I was so proud to host a dinner recently for international scientists at the Museum of Science & Industry in Manchester and show them local discoveries**
>
> **PROFESSOR DAME NANCY ROTHWELL**
> PRESIDENT AND VICE-CHANCELLOR
> MANCHESTER UNIVERSITY

SCIENCE FESTIVAL LIGHTS UP MANCHESTER

The sixth Manchester Science Festival, produced by MOSI in October, attracted 86,000 visits over nine days of events across Greater Manchester and its four universities. These included 25,000 visits to the Museum.

Director Jean Franczyk galvanised efforts to cement the Festival's reputation by bringing in a programme of collaborative events that starred the University of Manchester's Nobel prizewinning graphene team explaining how to make the new form of carbon, and Professor Tara Shears talking on the hunt for the Higgs boson at CERN.

A Museum highlight was the citizen science mass experiment developed with Professor Jonathan Swinton and the University of Manchester to commemorate Alan Turing's unfinished work on sunflowers. Participants were invited to grow sunflowers and record the occurrence of a Fibonacci sequence in the seed heads. Over 12,000 sunflowers were pledged in 13 countries, and the largest sample ever amassed to research this phenomenon did indeed find a mathematical sequence in 93% of sunflower spirals. The project was managed by Erinma Ochu, a Wellcome Trust Public Engagement Fellow. She will be a researcher in residence to advise on our next Citizen Science project.

One fascinating live experiment saw mathematician Matt Parker design the first domino computer on the floor of the *Revolution Manchester* gallery at MOSI and, as the standing dominoes fell, they carried out a series of calculations.

MOSI also hosted *Field of Jeans*, a display of catalytic clothing which brought together fashion designer Professor Helen Storey from London College of Fashion and chemist Professor Tony Ryan from Sheffield University. Jean Franczyk says: 'A stunning installation in our Upper Yard demonstrated science at work and science as culture.'

During the festival, the top floor of the 1830 Warehouse continued to prove itself ideal for installations and feature pieces such as Gina Czarnecki's *Palaces*. In the evenings, we even experimented with a programme of science-fiction movie screenings there.

90 CRACKLING YEARS

Beside the Museum's display of the original 2LO transmitter valves, Damon Albarn introduced a 90th birthday radio salute to the BBC. Through all of today's BBC radio services, the world listened. Art, science, magic. Unforgettable

GILLIAN REYNOLDS RADIO CRITIC AND MEMBER OF NMeM ADVISORY BOARD

'This is 2LO, London Broadcasting Station calling!' On 14 November 1922 at 17.33 GMT, that call sign marked the first British Broadcasting Company transmitter, 2LO, crackling into life thanks to 22,500 volts of electricity. Radio listening was to change from a specialist hobby to a national pastime. Ninety years later, at exactly the same time, a specially commissioned piece of music composed by singer-songwriter and record producer Damon Albarn was simultaneously broadcast via BBC stations to 120 million people across the globe. This was an ambitious first for the BBC and a great way to celebrate the enduring power of radio.

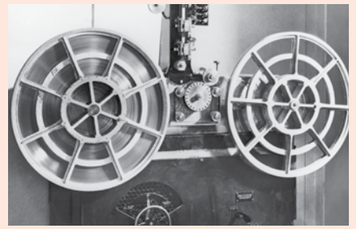
The broadcast was part of a special edition of Radio 2's *Simon Mayo Drivetime* show, live from the Science Museum in front of invited guests, including acting BBC Director General Tim Davie, and a new display, *The Voice of the BBC*, displaying parts of the original 2LO transmitter and a huge BBC microphone that was known as a 'meat safe'. During 2002 the Science Museum reached an agreement with the BBC and Crown Castle International Ltd, the owners of 2LO, for the transmitter to be donated to the Museum.

This temporary display explored how early radio underwent a rapid transformation. In 2014 we will move the 2LO transmitter to its new permanent home in *Information Age: Six networks that changed the world*, our new communications gallery, which is currently under construction.

Listen to the full 90th anniversary show here: **bbc.co.uk/news/entertainment-arts-20338770**

Damon Albarn [*main picture*] and Simon Mayo seen broadcasting from the Science Museum, and [*below*] a 'meat safe' microphone from the 2LO studio

RADIO RELICS ACQUIRED BY NMeM



The relics of early broadcasting shown here are part of the BBC Heritage Collection: 946 historical broadcasting objects celebrating 90 years of BBC history which have been donated to the National Media Museum, a selection being displayed in Bradford and at the Science Museum in London.

The Collection is a fascinating mixture of props and day-to-day artefacts from the life of the BBC as Britain's first official broadcaster, founded in 1922 by a private consortium of six radio manufacturers to stimulate the sales of radio sets. That these objects have survived is largely down to the efforts of BBC staff with an eye on history and the future, those who saved things for posterity. The majority are stored at the Science Museum Group's main storage facility in Wroughton (near Swindon), while some of the objects are being stored in Bradford. These include the Blattnerphone (1930), designed by early British film-maker Louis Blattner, which used 6 mm steel tape to record sound (notably the voice of Neville Chamberlain as he announced the outbreak of the Second World War to the nation in 1939); two original Emitron television cameras (1936); and the objects on display in *Experience TV*.

From top: Blattnerphone, 1932, designed by Louis Blattner, one of the earliest recording machines... Marconi-Reisz microphone used in the BBC effects studio... Cellist Beatrice Harrison performing with the birds in her Surrey garden as an annual broadcast from 1924... Table-top television screen magnifier, used to enlarge picture, 1950–55

A FILLIP FOR SCHOLARSHIP

It has been thrilling to observe the many successes of the Research and Public History Department, and especially its impressive record in attracting funds to support doctoral studentships

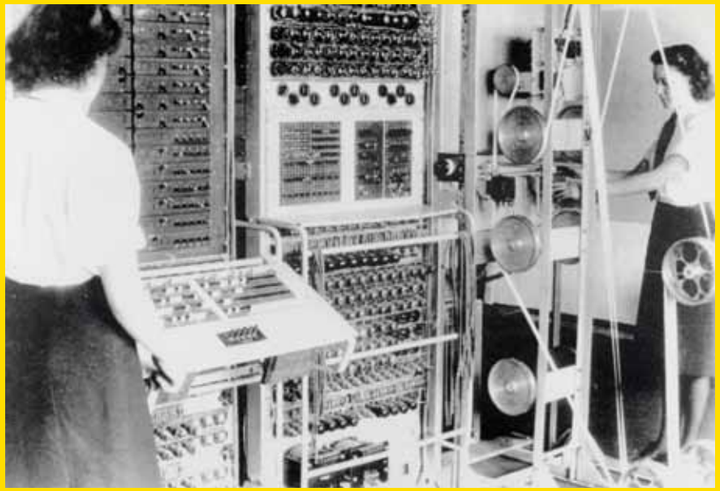
PROFESSOR LUDMILLA JORDANOVA
HISTORIAN AND SMG TRUSTEE

'One fantastic breakthrough this year was being awarded funding for 24 collaborative doctorates by the Arts and Humanities Research Council,' said Ian Blatchford, SMG Director. 'These funds mean that the brightest researchers can now research more remarkable special exhibitions for our public.'

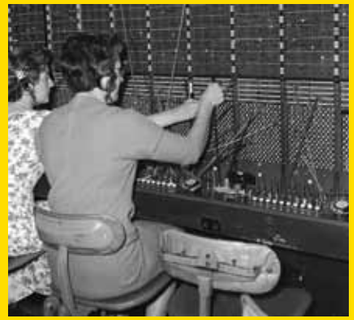
It is only a year since the Museum formally launched the Research and Public History Department, with Dr Tim Boon heading its mission to promote research on our collections. He said: 'The £1.4 million award for so many AHRC doctorates over the next three years – more than any other eligible institution – represents a huge vote of confidence in our ability to come up with good ideas. We can start growing the next generation of curators, and doctoral projects are a way of enticing the most promising scholars. Alison Hess is one example – her thesis on the BBC's first transmitter informed our 2LO display.'

A survey of creative technologists by Nesta and the Science Museum called for a 21st-century equivalent of the Computer Literacy Project of the 1980s which generated significant economic benefits.

Dr Tilly Blyth, a Museum keeper and author of 'The Legacy of the BBC Micro', said: 'Without this, we risk losing a generation of creative programmers and potential entrepreneurs skilled up for the digital age.'



From top: Britain's first digital electronic computer Colossus, to feature in AHRC-funded studentship... Researcher Alison Hess... York workshop in the PHoSTEM Research Network



Nostalgic stories: at NRM Norman Kemp contributed a photo of himself on honeymoon and a luggage display tells of a girl's solo journey by train
Above right: reunion by former telephonists in Enfield, 2012, and manual telephone exchange in Enfield, 1960

ORAL HISTORY COMES INTO ITS OWN

Meeting eyewitnesses influences the way you write exhibition labels

DR TILLY BLYTH
SM KEEPER OF TECHNOLOGIES AND ENGINEERING

A buzz phrase in the museum world is oral history as a way of delving into people's interests and motivations. NRM York has added theatre to Station Hall with an ambient soundtrack of chuffing engines, but also asked passengers to reminisce about yesteryear. This generated 700 such anecdotes which you now find posted around the trains as photographs and postcards.

But if you're trying to explain how a vintage plug-and-socket telephone exchange worked why not bring together some vintage telephone operators? The curators planning the Science Museum's new *Information Age* gallery decided to return to Enfield a 1920s manual telephone switchboard that we had collected from there in 1960.

As the centrepiece of a pop-up display called 'Number Please?' it attracted 15 former members of staff from the Enfield telephone exchange and dozens of others. With 90 minutes of film and a cream tea as bait, they were happy to talk about their daily routines.

Curator Tilly Blyth said the Museum is creating a UK Oral History Collection and the Enfield project is one among many. 'Talking to the inventors of technology is the usual way of tackling its history, but this is a more social process – seeing the use of those machines as part of their history and giving those people a voice whereas before they would have gone unheard.'

SMG SPREADS ITS LEARNING EXPERTISE

Science Museum Live on Tour! is a 60-minute theatrical adventure that introduces visitors to the wonders of science with dangerous demonstrations, extraordinary experiments and spectacle. In October, 3000 people saw the show over three weeks in the IMAX

> The Group's learning activities are hugely popular, with more than 600,000 booked education visitors and 1.7 million participants for demos, shows and workshops in the past year. That's why the Royal Society is keen to work more closely with the SMG museums

SIR PAUL NURSE PRESIDENT OF THE ROYAL SOCIETY

CONTINUED

SMG SPREADS ITS LEARNING EXPERTISE

The SMG Learning department excels at igniting an interest in science and engineering. Teachers are the first to seek out our Learning experts for their unbeatable hands-on experience, research and classroom resources.

Director of Learning Dr Alex Burch says: 'The SMG team works locally and internationally in strategic partnerships and with academic rigour to share our findings with the informal science learning sector. We know how important STEM subjects are to the UK and we are good at removing those barriers people face at all ages when confronted by science.

'Here's a great example. A group from Anson Primary School in London came to visit our Google *Web Lab*, an interactive gallery exploring how the internet works. They were so excited they went back to school and set up a web lab of their own – then posted a video about it on YouTube. This shows how a museum visit can transform the way children think. We shouldn't underestimate our audiences. They are information hungry. They are savvy and sophisticated and we'd do them a disservice if we don't challenge them.'

Clockwise: Buckinghamshire students tackle climate change with splatter guns... Outreach team demonstrating at Whitehaven... Science Museum Learning is supporting a schools partnership aboard SS *Great Britain* in Bristol... *Atmos* magazine written by students on the Climate Science Outreach Project... Teacher Zone workshops at Lates... Mystery Boxes developed by Talk Science and sold as teaching aids

In 2013 we launched Enterprising Science, a five-year partnership with BP and King's College London. We'll be working with 2000 teachers nationwide, and researching what shapes young people's attitudes to science and science careers.

SMG invests in education, communications and audience research: we deliver teacher development and seminars with academics and museum educators to explore ways our collections can support teaching. Building Bridges is an important three-year workshop project, funded by the BG Group, to increase science literacy among 11- to 12-year-olds, their teachers and families in five London boroughs. Dr Burch says: 'That year in transition from primary to secondary education is a crucial point when interest in science can fall off.'

The ongoing Climate Science Outreach Project in 50 schools across the UK completed its second year with students investigating climate topics and writing a superb magazine titled *Atmos*. Its third year saw 60 schools focusing on face-to-face science communication, which in one case proved to involve splatter guns.

Our reputation grows for science communication consultancy and helping set up museums internationally. This year we visited South Korea, Turkey, Malta, Saudi Arabia and staged science shows at a British Council-funded festival in Hong Kong and southern China. Santralistanbul arts complex in Turkey went online to buy our Mystery Boxes, a teaching aid which promotes the scientific method as a thinking process. In response Karen Davies, Head of Learning Resources, went to Istanbul to shape a programme of workshops.

Opposite: A4 locomotive *Dwight D Eisenhower* arrives at Liverpool from Canada en route to NRM York, where Mike O'Connor helps renovation

This page: 19th-century wax anatomical model after conservation... Aerial evacuation of the 22-metre Cambridge eight from the shipping galleries... Ticker tape transmitted from the *Great Eastern* in 1866

> The museums of the north make a contribution to the cultural and educational life of the north of England, and are an indispensable asset to children in our schools
>
> LORD ALTON OF LIVERPOOL

NEW LIFE FOR OLD FRIENDS

Two epic transfers made headlines this year: the transatlantic shunt of vintage locomotives via Liverpool to the National Railway Museum in York, and the decant of 1800 objects from the huge shipping galleries at the Science Museum in London. All required the expert loving care of our conservators.

The twin Yorkshire-built A4 Pacific express locos once known as 'streaks' were given cosmetic restoration ready to celebrate the 75th anniversary of their sister *Mallard*'s world speed record in July 2013 Heritage painter Mike O'Connor is seen here smartening up *Dwight D Eisenhower* in the York workshop, while volunteers at Shildon stripped *Dominion of Canada* back to the metal for a makeover.

The *Sailing Ships* gallery opened in 1963 to show off, among other things, the craftsmanship of the finest model ship builders. From autumn 2014 it makes way for the permanent *Information Age* gallery, which will celebrate communications technology and how we share information today. One of the trickiest items to evacuate was the 22-metre Cambridge rowing eight, which had to be squeezed under and over display cases before reaching Exhibition Road. All objects will be available for research either at Blythe House in London or at the former RAF airfield at Wroughton, where some will be housed in the new Hemcrete zero-carbon storage building made from hemp and lime.

Louisa Burden, Head of Conservation and Collections Care, said: 'This has been our biggest storage challenge in years and every hull, paddle and turbine required a condition survey. In need of conservation was some Morse code ticker tape transmitted from the *Great Eastern* on its first transatlantic cable-laying voyage of 1866.'

On more routine duty at Blythe House, conservator Emily Yates relished a macabre task cleaning and repairing a beautiful human anatomical wax model showing the internal organs and made in 1818. She said: 'I gently removed the dirt layers using a soft brush and a detergent solution, which brightened the coloured wax and made intricate features much more visible.'

SMG IS THE PLACE TO BE

After a couple of years of trying to win alliances with major organisations, now I take a more belligerent view,' says Ian Blatchford, SMG Director. 'If people are coming up with new initiatives to engage the public in science and technology, I really want to know why they're NOT working with us, rather than persuade them! We've made a very powerful case for us being a huge player in the past year.'

Dr Roger Highfield, Director of External Affairs, says: 'British scientific research punches above its weight and the Science Museum Group is clearly the most formidable showcase for showing off the coolest new ideas to 5 million people. Our fans are savvy too.'

For National Science and Engineering Week in March 80,000 people visited our website to vote for its Great British Innovation of the past 100 years and a mighty majority opted for Alan Turing's 'Universal machine' – the theoretical basis for all computing. This poll was a unique collaboration between SMG and the GREAT campaign (based at 10 Downing Street), BIS, the Royal Society, Royal Academy of Engineering, Engineering UK, and the British Science Association. Highfield adds: 'Its legacy is a substantial website written by experts.'

Visit the Great British Innovation site:
www.topbritishinnovations.org

"This is a remarkable venue, and I say that as someone who has visited a lot of museums

ERIC SCHMIDT GOOGLE'S EXECUTIVE CHAIRMAN LECTURING AT THE SCIENCE MUSEUM

1

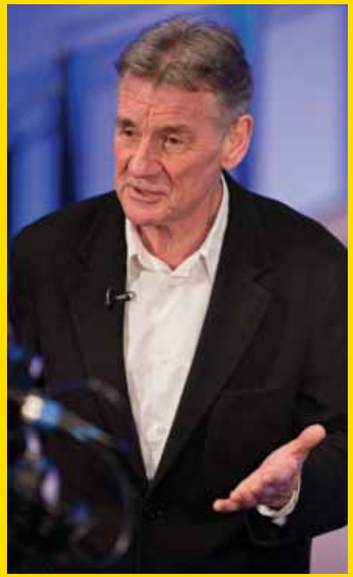

2

3

4

1 BIS Secretary Vince Cable opens *Make it in Great Britain* at the Science Museum
2 Carol Vorderman names the *Battle of Britain Memorial Flight* locomotive at NRM York
3 Professor Rolf-Dieter Heuer at SM Annual Dinner
4 Deputy Prime Minister Nick Clegg takes questions at MOSI
5 Will Smith premieres *Men in Black 3* at the Science Museum
6 Michael Palin introduces the 50 Years of Beeching debate
7 Dr Tara Shears talks on the Higgs boson at MOSI
8 Metal plates from Crick and Watson's double helix displayed at the Science Museum
9 Director Ian Blatchford chairs environment discussion beside Lord Smith at the Science Museum
10 Journalist and UNICEF supporter Simon Reeve hosts Rio Summit Question Time at the Dana Centre
11 Lord Bragg [*third left*] at the sixth Arts and Media Lunch hosted by the Science Museum


5


6


7

"I am voting for Double helix in the Great British Innovation Vote via @sciencemuseum #GreatVote

DAVID CAMERON PRIME MINISTER, TWEETING DURING THE GREAT BRITISH INNOVATION VOTE


8


9


10


11

CROSSING THE FRONTIERS OF CULTURE

English Touring Opera performing *Laika the Spacedog* at the Science Museum in January: set in the Russia of 1957, this opera for children tells the story of the first animal to go into Earth orbit aboard Sputnik II

> Science is part of our culture so it has been exciting to see the Science Museum finding innovative ways to create bridges with music, art and the theatre, bringing new audiences into the Museum
>
> **PROFESSOR MARCUS DU SAUTOY** PRESIDENT OF THE MATHEMATICAL ASSOCIATION

LIFT HERE

Below: Theatre company Complicite staged a try-out in the Science Museum's IMAX auditorium of *X & Y*, an absurdist drama written by mathematician Professor Marcus du Sautoy, which took a major step in developing the IMAX as a 420-seat theatre.

Centre left: Viva Aerial Dance use silk banners to represent genetic switching during *ENCODE: Dance of DNA*

Right: *The London Road Viaduct*, 1848, by James Wilson Carmichael from the NRM collection

Below right: Eamonn McCabe's father-and-son photograph at the National Media Museum

Top: Sound Artist in Residence Aleks Kolkowski demonstrated a 1909 hand-cranked Edison phonograph to commit to wax cylinder acoustic recordings by beatboxer Jason Singh, Writer in Residence Mick Jackson and thereminist Nahum Mantra. Another event collaged early radio archive recordings, newly composed text and hefty doses of radio interference.

Right and below: Of the movement-based interaction and planetarium-style projection at *Universe of Sound*, Esa-Pekka Salonen, the Philharmonia Orchestra's Principal Conductor, said: 'Our world is by turns preposterously loud, pin-drop quiet, highly charged, intense and frequently overwhelming.'

CROSSING THE FRONTIERS OF CULTURE

'Music will be one of our best weapons in smashing the art–science divide,' says SMG Director Ian Blatchford. '*Universe of Sound* was a daring interactive digital installation in which visitors could conduct, play instruments and step inside a virtual Philharmonia Orchestra, joining 132 musicians and conductor Esa-Pekka Salonen, in performing Holst's *The Planets*. We had to extend its run three times because of popular demand.'

The shock of the unexpected has become commonplace on the Science Museum's cultural events calendar, whether it's the Viva Aerial Dance company heralding important news from *Nature* about the ENCODE genetics project, a Glyndebourne simulcast in the IMAX theatre, or ETO's children's opera *Laika the Spacedog*.

As Head of the Arts Programme for many of the past 17 years, Hannah Redler has been stirring the Group's rich cultural masala even more vigorously in the past year while planning for this autumn's Media Space galleries launch. She's not content with merely rotating displays from our collections but also brings in contemporary artists to challenge cultural divides.

She says: 'It would be wrong to be starry-eyed and just trot out achievements in science and engineering without considering how they impact on ourselves and the planet around us. That's what

Left: Bradford's Media Museum screened live relays from both New York's Metropolitan Opera and National Theatre Live to sellout audiences, while the Science Museum [*above*] staged another Glyndebourne simulcast, and interval 'picnic' in the *Flight* gallery.

Right: As part of a major new exhibition, *Tony Cragg at Exhibition Road*, the Science Museum displayed works by the British sculptor, while the *Mathematics* gallery [*beneath*] shared a display with the Royal Society of abstract stringed sculptures by Henry Moore inspired by visits to the Museum.

Above and left: Since opening its humidity-controlled art gallery, the NRM in York has been showing off its vast collection of railway paintings, prints and posters. In *Fear & Fascination* artists from 1830 onwards captured the anxiety people felt about early railways.

artists can do and they can be subjective, which is more difficult for the Museum through the rest of its programme. Artists can make us stop and think about the philosophical and ethical questions. That's why I'm here.'

At MOSI in Manchester the challenge was exemplified in Gina Czarnecki's exhibition which explored the life-giving potential of 'discarded' body parts. *Palaces* was made with donated milk teeth and raised questions about the mining of stem cells, while a nearby pair of Art Deco armchairs 'stuffed' with human fat extracted during liposuction amplified the show's title, *The Wasted Works* [*see page 22*].

As part of its 40th anniversary celebrations, the Royal Northern College of Music performed at MOSI offering 'a variety of sounds and genres, all with an industrial feel'.

At the National Media Museum so rich are the photography collections that when Bradford City FC hit the trail to the 2013 Capital One cup final, a temporary display of photographs was quickly mounted by drawing on superb images shot 20-odd years ago by Eamonn McCabe and Ian Beesley. A blog appeal located a father and son spotted on the terrace in one of the vintage images. 'I'm the shouty kid with my Dad in this Bradford v Ipswich picture from the 1987/88 "nearly" season,' wrote Chris Browell, BCFC supporter, who saw himself immortalised as an 11-year-old.

CELEBRATING WOMEN WHO EXCEL

We held special events in London and Manchester to draw attention to the roles of women in science and engineering. The *High Performance* festival in March promoted women working in motor-sport technology, particle physics, aviation, astronomy and fuel-cell engineering, and the college students who might join them in those careers. 'It was our contribution to International Women's Day and a strong push back against some lazy press coverage the previous year that had focused just on women in the arts and design,' says Ian Blatchford, SMG Director.

Visitors to the Science Museum, including Ministers Maria Miller and Jo Swinson, enjoyed three days of free talks, demonstrations and workshops. Leading participants included Skoda motor-sport engineer Teena Gade and Shell Technology Manager Dr Cara Tredget, who put chemistry at the heart of Formula One. Hi-tech racing team Viridity GRT showcased a kit car, while Cambridge University Eco-Racing demonstrated their latest solar-powered car. British astronaut Helen Sharman called the festival 'fantastically inspirational'.

From top: Engineers Leena and Teena Gade at the Science Museum... Culture Secretary Maria Miller meeting astronaut Helen Sharman... Junior Minister Jo Swinson in the solar-powered car

NEW DEALS, NEW FRIENDS ABROAD

During 2012–13, SMG made significant progress expanding international collaboration, aiming to rebuild its reputation as a truly international organisation. In order to get best value from such work and set the direction for future developments, a Science Museum Group International Strategy was agreed by the Board of Trustees in November.

As Director of the Group, Ian Blatchford made several ambassadorial trips abroad to discuss partnership projects and reciprocal exhibitions, principally to Russia, Japan, Brazil, India and to France since the Science Museum co-founded a new forum for directors and chief executive officers of the major public national science museums in Europe. The Director says: 'We have been re-forging many friendships that we had let lapse.'

A particular highlight was the signing of a Letter of Intent between the governments of the UK and Brazil and the Science Museum to cooperate on science communication and education. The document was signed by Aloizio Mercadente, Minster for Education, Brazil; David Willetts, Minister for Universities and Sciences, UK; and Ian Blatchford, Director of the Science Museum Group, in London, July 2012, in the presence of President Dilma Rousseff of Brazil.

The Director also travelled with the Prime Minister's delegation to Brazil in September 2012.

See inside front cover for SMG activity map

Clockwise from top: Director Ian Blatchford with the Prime Minister's trade mission to Brazil; at the Foreign Ministry, Moscow; at Presidency University, Kolkata; at Miraikan, Tokyo

MOSI'S BOLD NEW MASTERPLAN

'Our first year since joining SMG has been about repositioning MOSI so it can take its place within the family of Museums,' says Jean Franczyk, the Director. 'We have to transition from being a well-loved local institution into being an internationally significant museum with a really strong Manchester personality. This calls for high standards, new ways of working and a ten-year Masterplan to articulate those ambitions. We've set an initial fundraising target of £5 million.'

To emphasise Manchester's role as both a historic and contemporary powerhouse has required shifts in practice across exhibitions, learning and collections [*see page 64*]. The Museum's arresting 19th-century site is its best asset, so its storytelling aspects are being enhanced. Prime attractions are the world's oldest surviving inter-city station and the atmospheric 1830 Warehouse [*see page 49*]. A new survey shows the average MOSI visit lasts almost three hours – considerably longer than at other museums.

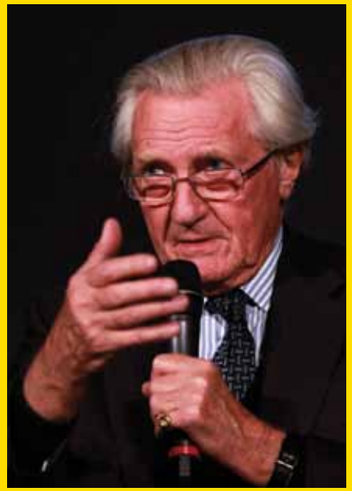
The year's renewed focus on events developed better use of the entire site, including our public realm during the FutureEverything Festival. Indoors, live shows were delivered in *Revolution Manchester* and the Power Hall while the 1830 Warehouse proved the strongest venue for art/science installations such as Stephen Hurrel's *Beneath and Beyond*.

A major cause for concern is Network Rail's new rail route which threatens the MOSI site. We are fighting to eliminate or reduce its impact.

I enjoy opportunities to take people's questions and always enjoy coming to Manchester, and MOSI is such an impressive setting

NICK CLEGG DEPUTY PRIME MINISTER

Top: Romanticised vision of Liverpool Road Station, Manchester, and the 1830 Warehouse, painted by A P Harris in 1980
Right: Ollie Palmer's digital *Ant Ballet* installed in the Warehouse



JOIN THE DEBATE: WHY SCIENCE MATTERS

Our Museums aim to become forums for initiating policy conversations, and SMG has embarked on hosting debates and seminars with policymakers, scientists, historians and educationalists.

In January the Science Museum hosted Science Policy in the Real World, a discussion about the experience of being science minister between the current incumbent, David Willetts, and two predecessors, Lord Sainsbury and Lord Waldegrave. The invited audience comprised leaders from education and Whitehall and the event was co-organised with the Royal Society and the Mile End Group of Queen Mary University of London.

In February, key individuals from Government, industry, academia and consumer bodies met to discuss issues facing water use in a meeting organised with the Department for Environment, Food and Rural Affairs and the Met Office. Held at the Science Museum, it was chaired by the Director, Ian Blatchford.

Other events saw Lord Heseltine deliver the CaSE Annual Lecture 'An Industrial Strategy'... Google Chief Executive Eric Schmidt lectured on the importance of science museums in inspiring the next generation... Debates took place at both the Science Museum and National Railway Museum to mark the 50th anniversary of the Beeching cuts on Britain's railways... At the Science Museum the University of Leicester staged a prescient debate on the role of tangible objects versus online science museums.

If we're to impress the Treasury we should make an economic case as well as the cultural one. And SMG has one

DR ROGER HIGHFIELD SMG DIRECTOR OF EXTERNAL AFFAIRS

From top: Lord Heseltine and Eric Schmidt lecturing; and David Willetts, Lords Hennessy, Waldegrave and Sainsbury debating at the Science Museum

THE JOYS OF CURATING

We asked six of the Group's busiest curators what aspect of their work proved most rewarding during the past year

Alison Boyle

SM DEPUTY KEEPER OF SCIENCE AND MEDICINE

Planning next November's *Collider* exhibition meant going underground at CERN, which has to be a highlight of anyone's year! But what has struck me most is going through the Z Archive (the Science Museum's own history), following F A B Ward, who built up our modern physics collection, and seeing how the issues he faced in collecting big physics are still live. You always think about what you're adding to an object's story, and what future curators will make of it.

Alison in *Making the Modern World* with the Cockcroft-Walton voltage multiplier, early 'atom smashing' apparatus and precursor of the CERN adventure

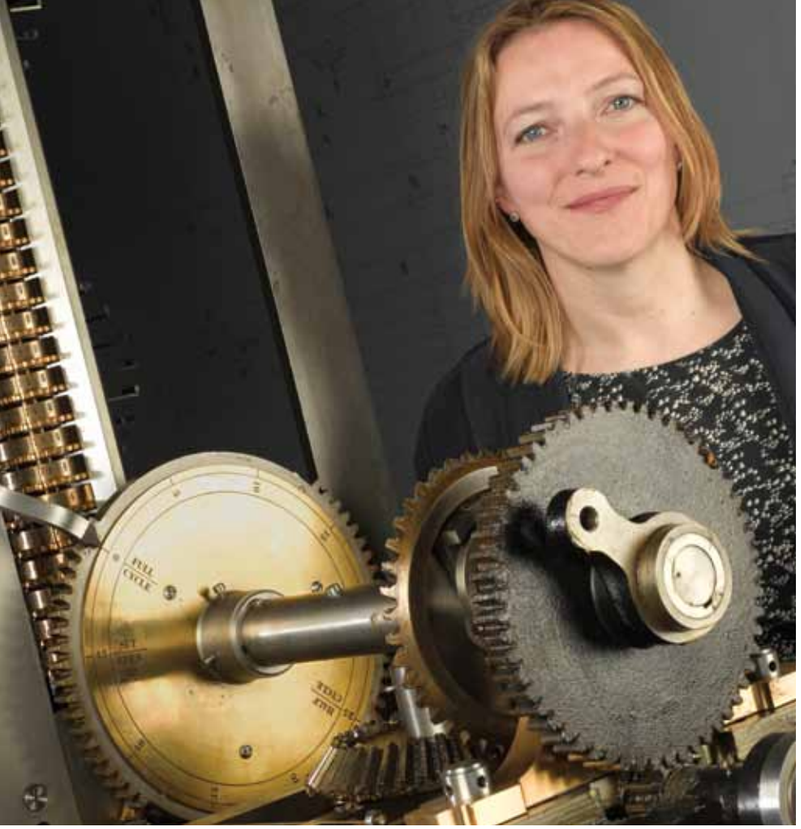
Ed Bartholomew

NRM SENIOR CURATOR, IMAGE AND SOUND COLLECTION

NRM's new gallery has showcased art works from the collections which we've previously been unable to display for conservation reasons. The poster is a democratic form of applied art that passengers and railway workers could see displayed on stations, and I've been really pleased to see our posters on show here and at the National Museum of Scotland in Edinburgh. I've also been delighted to work with students from the University of York, particularly our MA art history partnership student, Frankie Drummond.

Ed with a Southern Railway poster from the 1930s, a 'modernist design advertising newly electrified commuter services'

CONTINUED



Dr Tilly Blyth

SM KEEPER OF TECHNOLOGIES AND ENGINEERING

The craft of the curator is in layering the experiences across a gallery and creating awe with our amazing objects. During the development of our new *Information Age* gallery I've had the honour to start a new public interpretation of the World Wide Web with the man who created it, Sir Tim Berners-Lee. My favourite object is ERNIE (1957) – the Electronic Random Number Indicator Equipment – built to generate winning Premium Bond numbers. He's a beautiful machine and reminds us of the importance of public sector research for innovation.

Tilly beside Difference Engine No. 2, designed 1847–49 by British computing pioneer Charles Babbage and built by the Science Museum

Greg Hobson

NMeM CURATOR OF PHOTOGRAPHS

The most exciting thing about my job is that nothing remains the same. Curatorial practice is constantly evolving, the collection is growing and responses to photography's histories are shifting as the technologies – and access to them – shift and become more democratic. In this context, working with the photographer Martin Parr on a thorough investigation of our Tony Ray-Jones archive for the first Media Space exhibition [*opening September 2013*] has been a genuine thrill. Ray-Jones's notebooks distil what is special about our collection, which is its breadth and depth.

Greg browses a Tony Ray-Jones notebook which details photographic technique, reading lists for research, and places he wanted to photograph

Jack Kirby

MOSI HEAD OF COLLECTIONS

A large part of the appeal of the job is having the world's first railway warehouse and oldest surviving passenger station on site. Currently these atmospheric buildings aren't well understood by our visitors, so there's a great opportunity to explain why they're so important and convey the excitement that the railway caused when it opened in 1830. The Liverpool & Manchester was the first recognisably modern inter-city railway and its features were copied around the world. It's a great story that exemplifies Manchester's global influence.

Jack stands in the best-preserved office of MOSI's 1830 Warehouse, with the original desks still *in situ*

Doug Millard

SM DEPUTY KEEPER OF TECHNOLOGIES AND ENGINEERING

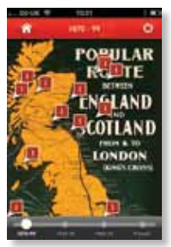
In April 2013 I visited Moscow to meet former cosmonauts Vladimir Dzhanibekov, Anatoly Artsebarsky and Alexander Lazutkin – this for the Museum's *Cosmonauts* exhibition project. There is an image for ever framed in my memory of the two old travellers in space – Dzhanibekov and Artsebarsky – smiling fondly at each other, grasping hands as they hugged, acknowledging an understanding we can't imagine and that needed no words.

Doug with a model of the Ariel 1 satellite that made Britain the world's third space-faring nation in 1962. 'I found it in a Suffolk antiques shop in time for Ariel's 50th anniversary exhibition and conference. It was made by McMichael Radio Ltd as part of the company's work in developing, with Imperial College, the cosmic ray analyser, one of the instruments flown on the satellite'

DIGERATI BREAK ONE RECORD AFTER ANOTHER

A major redesign of the Science Museum home page caused online visits to leap by a third this year – that's an extra 4 million clicks onto our site – and won an honourable mention in the international Webby Awards. Bloggers across all five Museums have raised their profiles and the Group's websites together broke records by attracting 20.5 million visits in total. The National Railway Museum showed a dramatic 48% increase in web traffic, and the National Media Museum a 21% increase. On the commercial front, the invaluable research resource held by the Science & Society Picture Library showed an 11% increase to 1.5 million visits. The NMeM's Your Life Online blog continues to yield compelling visitor confessions, and its ground-breaking digital Mirror quiz yields data for researchers in The Psychometrics Centre at Cambridge University. At its launch curator Tom Woolley said: 'It's fascinating for people to discover more about their personality by simply "liking" something online!'

Other digital advances: NRM launched its first East Coast railway history Time Line app to enhance passengers' journeys as they travel... The Science Museum hosted a national competition, ExPlay Game Jam 2012, with support from the Wellcome Trust and Abertay University, Dundee... Our online Climate Change game Rizk has been played 3.2 million times on 1300 different websites... And Stephen Fry demonstrated the power of the tweet: while filming an interview with curator David Rooney he triggered 1000 new Science Museum followers... In the pipeline we have a Spectacular Science super-app featuring 100 objects from our collections.



From top: ExPlay Game Jam 2012... The Science Museum's upgraded website... NRM's East Coast Time Line app takes travellers on a free interactive journey

A MAGNET FOR YOUNG ADULTS

The title Lates sounds innocent enough. But the monthly over-18s night has become a heaving social cauldron at the Science Museum, breaking records this year with peak Wednesdays exceeding 5000 visitors in an evening. The independent adult demographic is mainly aged 18 to 30 (though many maturer good-time science lovers are in evidence too) and the Learning team offers a richly mixed programme of 20 on-site activities on themes such as climate change, broken hearts, sport, surveillance, music and mental health.

All provided plenty of serious brain-food. This year featured workshops on quantum physics, heart surgeon Gianni Angelini demonstrating in our historic operating theatre and a high-profile talk from Sir John Beddington, about his work as the government scientific adviser.

Alongside the wild silent disco and interactive live games, there will always be university research teams eager to amass data sets. Even at the one-off ZombieLab, proposed by the Contemporary Science team, the University of Essex collective behaviour expert Dr Edward Codling reported: 'We managed to collect loads of data from a computer simulation game and we will be writing this up as quickly as possible into a journal paper.'

Teacher Zone is a way of highlighting the Museum's collections, galleries and learning activities for professionals, and the versatile Talkaoke desk provides an intimate forum in which to quiz guest scientists about their work.

> "This audience is culturally aware and curious. They are capable of drinking AND thinking

ANTHONY RICHARDS
SM MANAGER OF GALLERY PROGRAMMES

The zombie-themed Lates broke records and studied consciousness... The Talkaoke desk creates an instant talk show... Visitors learn the dance steps to Michael Jackson's 'Thriller'

YEAR OF THE VOLUNTEER

Why does NRM attract several times more volunteers than other Museums in the Group? This year MOSI had 129, NMeM had 85, SM had 158, but NRM's combined total rose to 380, contributing over 36,000 hours across its two sites.

'You have to understand what motivates somebody to volunteer,' says Matthew Hick, the Volunteer Officer, who aims to introduce a city-wide charter to improve volunteering standards across York. 'People volunteer for many reasons and have hugely varying demands on their time. It is important that supervisors understand and respect this.' One way NRM addresses this is by offering flexible roles. 'We provide object research projects for volunteers to do in their own time,' Hick says. 'People can give as little or as much time as they want.'

A bright idea he and Lindsay Coomer from Learning and Development introduced was Volunteer Manager's training. The course provides staff with skills to manage volunteers and these may differ from what paid staff require. This course is now delivered across SMG, resulting in raised staff confidence and more diverse projects. To mark its Year of the Volunteer NRM threw several parties as a reward for dedication – as well as awarding the usual long-service medals.

Below left: NRM's Volunteer Officer Matthew Hick with a new intake of research volunteers
Below: Workshop volunteers at NRM and MOSI

INVENTIVE TRIO IN RESIDENCE

Three artists in residence at the Science Museum this year were a writer, an inventor and a musician. According to Hannah Redler, Head of Media Space and Arts Programme: 'Artists with inquiring minds can reflect on the role of the institution and challenge its culture in surprising ways.'

The sound artist Dr Aleks Kolkowski staged various demonstrations drawing on apparatus from our collection [*see also page 37*]. Redler says: 'We wanted to make the residencies research led, and Aleks is interested in preserving and making live today the sounds of the past.'

For Music Day last June he re-enacted an Edwardian concert in which a live orchestra from the Royal College of Music played alongside the auxetophone from our collection – this is an early amplification device from 1905 that played recordings of famous singers of the day. Cafés, clubs and restaurants would advertise 'Caruso in concert tonight' and this pioneering audio technology starred centre-stage.

'Both Aleks and Mick Jackson have been perfect artists in residence, wanting to participate in the life of the Museum community,' Redler says. 'Mick is a bestselling author who also held workshops with the staff. We published his wonderful piece of life writing, *My Running Hell*, to tie in with the season of sport.'

HOW I WAS MADE

Inventor in Residence Mark Champkins produced a range of retail goods for the Museum such as a kit of scientific instruments and a biodegradable bauble that contains a seedling Christmas tree. Each glass, mug or tote bag in his 'Beauty in the Making' range is covered in an intricate surface print that tells the story of how its constituent material was produced.

Clockwise: Sound artist Aleks Kolkowski de-swarfing his 1909 Edison phonograph... Mick Jackson takes a breather... Mark Champkins' tote bag pattern tells how it was made

THE BRAGG DOUBLE MIRACLE

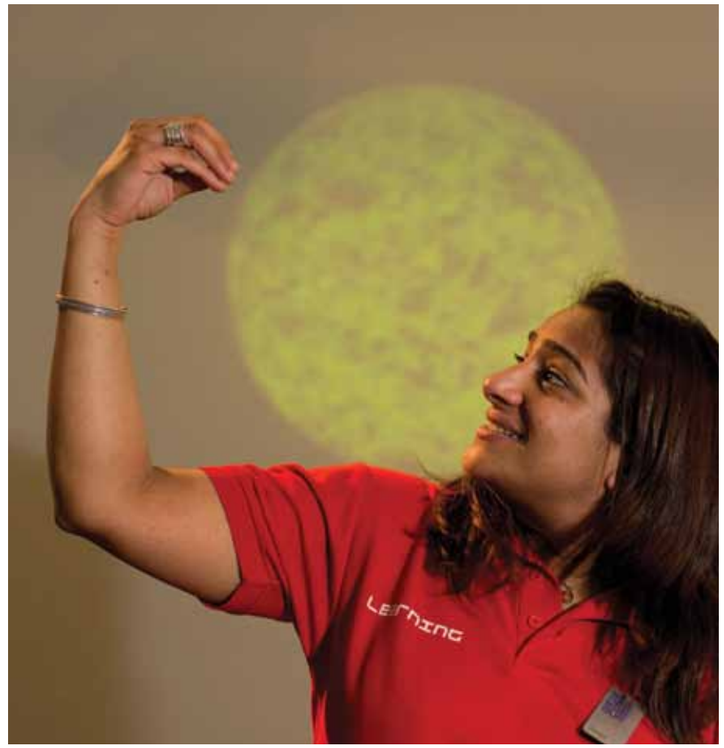
In 1913, following the discovery that crystals produce patterns when subjected to X-ray bombardment, father-and-son team William and Lawrence Bragg formalised the laws of X-ray crystallography. They won a Nobel Prize – Lawrence, at 25, remaining to this day the youngest winner. To celebrate the centenary, the Science Museum opened *Hidden Structures*, a new display of striking models resulting from X-ray analysis of molecular structure, most of which won further Nobel Prizes, for Kathleen Lonsdale, Dorothy Hodgkin, Francis Crick, James Watson and several for the prolific MRC Laboratory of Molecular Biology (LMB), Cambridge. The most surprising legacy of crystallography is its influence on modern design. At the 1951 Festival of Britain one of the main visual motifs was atomic structure.

Here we see an important early model of human haemoglobin proposed in 1967 by Max Perutz at the LMB. It was the first protein for which 3D modelling really changed the understanding of its function. Their 'Studies of the structures of globular proteins' had won a joint Nobel Prize in 1962 for Perutz and John Kendrew.

ACCESS FOR ALL

Monthly and during holidays the Science Museum offers SIGNtific, our deaf-led family events with voiceover interpreters, suitable for deaf and hearing audiences. One interactive storytelling session explores Iceland and its erupting volcanoes. There are tours too during our adults-only Lates events. Surprisingly BSL has very few signs relating to science, but here we see one of our guides Deepa Shastri [*right*] making the rather glorious gesture for the Sun. The shop sells a selection of BSL videos on the history of medicine and climate science, while staff are currently being trained in the Makaton signing system.

Visually impaired and blind visitors now find Braille labels installed in the *Who am I?* gallery to accompany the touch objects, while Braille information books are available in the hands-on *Launchpad* gallery.



HENRY WOWS BRADFORD

This year the National Media Museum welcomed 493,000 visits, three-quarters exploring the galleries, the rest viewing film. A major new attraction was *Life Online*, the world's first permanent gallery dedicated to the cultural impact of the internet. In October, Bradford City held its first Science Festival in which the Museum played an important part. As part of Positive Bradford Day, we took our photography handling collection and Cottingly Fairies talk out into City park.

The newly expanded *Games Lounge* offered even more about the history of video-gaming, hosting a BAFTA Young Games Designer event and free web design workshops. February half-term holiday attracted 35,000 visits to activities inspired by the popular character Horrid Henry, delivered in partnership with Orion Children's Books.

LEARN HOW TO SHUNT

Trainees at the new Steam School at the Museum of Science & Industry in Manchester learn how to drive the historic Agecroft No. 1 steam locomotive and to shunt wagons around the Museum site [*volunteer driver Gordon Reece pictured below with learner Mike Thornton*]. The former 1830 Liverpool Road station is the world's oldest surviving passenger railway station, and Steam School trainees enjoy a tour, lunch, a photograph and certificate, as well as two hours' tuition. The treat was one of several unusual gift ideas on offer at MOSI which included a photography workshop by the acclaimed Manchester photographer Andrew Brooks.

'CAB IT' ABOARD A TANK

While NRM York boosted its attendances this year to exceed 700,000, special events make all the difference at its sister Museum in Shildon, which attracted 200,000. Last autumn's 8th Anniversary Steam Gala [*pictured here*] featured guest tank engines to pull in the crowds, who enjoyed access to footplates in between rides. The Museum is jointly run with Durham County Council and as well as the striking collection of rolling stock, its outlying 19th-century buildings remind us that Shildon is the birthplace of railway engineering in Britain and themselves justify an outing.

SMG AWARDS

Science Museum Group

The Hemcrete store at Wroughton won Best Workplace New Build in the Greenbuild Awards, and was also Sustainability Winner in the Museums and Heritage Awards.

Science Museum

Access for All Silver Award from Visit England.

Winner of Royal Philharmonic Society Award for Audiences and Engagement, for *Universe of Sound*, our digital music collaboration with the Philharmonia.

Relaunched website was an Honoree in the Best Home or Welcome Page category at the Webbys.

Codebreaker won first prize in the 2012 Great Exhibitions competition for large displays run by the British Society for the History of Science Outreach and Education Committee.

Science Museum Live on Tour! was highly commended in the Educational Initiative category of the Museums and Heritage Awards.

Dr Roger Highfield, Director of Science Museum Group External Affairs, won the Royal Society's Wilkins-Bernal-Medawar Medal for 2012.

Dr Robert Bud, Keeper of Science and Medicine, Science Museum, took the University of Ghent's 27th Sarton Chair for the History of Sciences.

Museum of Science & Industry

Best Hospitality Venue of the Year at the City of Manchester Business Awards.

National Railway Museum

Visit York Award 2013 for Conference Venue of the Year.

National Railway Museum at Shildon

Outstanding Volunteer Team Award at the North East Museum Volunteer Awards, honouring 80 volunteers.

National Media Museum

Life Online commended in the Interactive Design category by the IDI (Irish Design Institute) Awards.

BIGGEST HORN IN BRITAIN?

These are the craftsmen in our workshops responsible for making and maintaining the furniture that supports and displays precious objects, and maintaining moving parts throughout the Science Museum. On occasion they land a juicy challenge such as this: a complete rebuild of a legendary loudspeaker horn which hung in the Museum from 1929 onwards and drew crowds by relaying early BBC broadcasts with unprecedented clarity.

Its exponential shape was crucial, as were its overall length of 8.23 m (27 ft) and square mouth 2.16 m (7 ft 1 in) across, but it was destroyed during a demolition accident in 1949. The drive unit, a Western Electric 555W made for cinema amplification, remained on display – but not until 1982 did a Museum Assistant, now curator John Liffen, chance upon an 8 ft fragment from the horn's narrow end in our Blythe House store. Somebody had had the foresight to mark it 'Keep'.

Scroll forward to 2012 when artist in residence Aleks Kolkowski had the bright idea to attempt a reconstruction and used funds from his residency allocated for materials towards the project which was managed by the Arts team and fully supported by Liffen. That's what has clearly put the smiles on the faces of Steve Long's workshop team behind those masks.

Widescreen Weekend: Cinerama requires three synchronised projectors at the National Media Museum

UNESCO CITY OF FILM

The 19th Bradford International Film Festival, organised by the National Media Museum in the UNESCO City of Film, was our second with Virgin Media as title sponsor. It offered 10 days brimming with riches, star guest appearances, 30 British films and 56 UK premieres by Bernardo Bertolucci, Olivier Assayas and even a David Lynch short, not to mention Dolph Lundgren, Susanne Bier and Joss Whedon. Filmmakers' Weekend provided some lively masterclasses.

BIFF celebrated the 50th anniversary of *Billy Liar* by giving Sir Tom Courtenay a Lifetime Achievement Award and enjoying a very warm interview with him, while Jo Quinton-Tulloch, Head of Museum, chose as her favourite strand Happy Birthday Indian Cinema with its century-spanning retrospective of 'the most abundant of all cinemas'.

Widescreen Weekend celebrated 20th Century Fox's cinematographic process CinemaScope, and a glorious digital revival of the second Cinerama film, *Cinerama Holiday*, was screened in our Pictureville Cinema, one of the few anywhere able to show this 1950s widescreen system which requires a synchronised triple-projection suite.

Other important events in the Museum calendar included November's Animation Festival featuring significant practitioners in both studio and digital games production.

> We are back in Berkeley after a thrilling trip to Bradford, London and Boston. Your festival was a favorite of ours: diverse programming, fabulous projection and terrific people. We loved screening Tokyo Waka there

KRISTINE SAMUELSON OSCAR-NOMINATED DIRECTOR

SUMMER OF OLYMPIC THRILLS

In partnership with the BBC and Japanese broadcaster NHK, the National Media Museum was one of only three locations in the UK to showcase Super Hi-Vision technology. Developed for the Olympics, this future television system creates a picture 16 times sharper than current HD television. Muriel Hearnshaw, a veteran Bradford athlete from the 1948 'austerity' Olympics, attended a Super HV screening of one of the Olympic swimming events and visitors said it looked thrillingly life-like. The Olympiad was celebrated across SMG. The Royal Scot class steam locomotive *Scots Guardsman* carried the Olympic flame from the National Railway Museum in York to Thirsk as part of the torch relay.

The Science Museum mounted four *Antenna* sports exhibits and events where visitors could try a range of Paraylmpic wheelchairs and cutting-edge sensor technology. The *Make it in Great Britain* exhibition, developed by the Department for Business, Innovation and Skills, showcased British manufacturing.

At the NMeM *In The Blink of an Eye* combined material from the national collections with contemporary work to explore how media have captured movement. Local Polish and Roma/Gypsy communities contributed memories to a series of short animated films titled *Fragile Stories*, which has since been screened all over Yorkshire.

> It was a special pleasure to see the National Media Museum host one of the BBC's Olympic Super Hi-Vision screens, bringing cutting-edge innovation to Bradford and thrilling audiences

ROGER MOSEY BBC DIRECTOR LONDON 2012

2012 Olympics: Muriel Hearnshaw experiences Super Hi-Vision in Bradford... *Antenna* displays prosthetic legs in London

BRIGHT IDEAS DON'T FUND THEMSELVES

Tougher economic times mean we must secure our own finances to realise all of our ambitions

Fundraising at the Science Museum Group leans heavily on developing partnerships through sponsorship, securing investment from trusts and foundations and relies significantly on private philanthropy. To take the lead in building more high-value relationships with private donors we have created the Science Museum Foundation chaired by Michael G Wilson, executive producer of the James Bond movies. A key individual philanthropist this year was will.i.am, the Black Eyed Peas musician. Following his £500,000 donation to the Prince's Trust, the star visited the Science Museum to launch a programme of STEM workshops in marketable skills. These will be delivered to disadvantaged 13- to 19-year-olds by the Museum after regular lessons in schools across the country.

> **I am proud to see my donation to the Prince's Trust being put into action to help engage disadvantaged youth who would not otherwise have access to technology and science education**
>
> **WILL.I.AM** RECORDING ARTIST AND PHILANTHROPIST

The SMG Development department held over 40 events last year, welcoming thousands of existing and potential supporters into our Museums. They enjoyed private gallery tours, visits to collection storage sites, receptions with leading scientists and to celebrate exhibition openings, dinners to thank funders and cultivation events (most recently to fund our new *Mathematics* gallery, due in 2015). At the year's most prestigious event, the Director's Annual Dinner in London, fellowships were awarded to Professor Stephen Hawking and Professor Rolf-Dieter Heuer, Director General of CERN.

At the National Railway Museum in York the Annual Dinner was reintroduced thanks to our Railfest industry partners and the Station Hall refurbishment was completed with support from First Group, Hornby and others. Capital fundraising was completed for the new Media Space in London, with support from Virgin Media alongside the Wilson Family and the Dana and Albert R Broccoli Foundation.

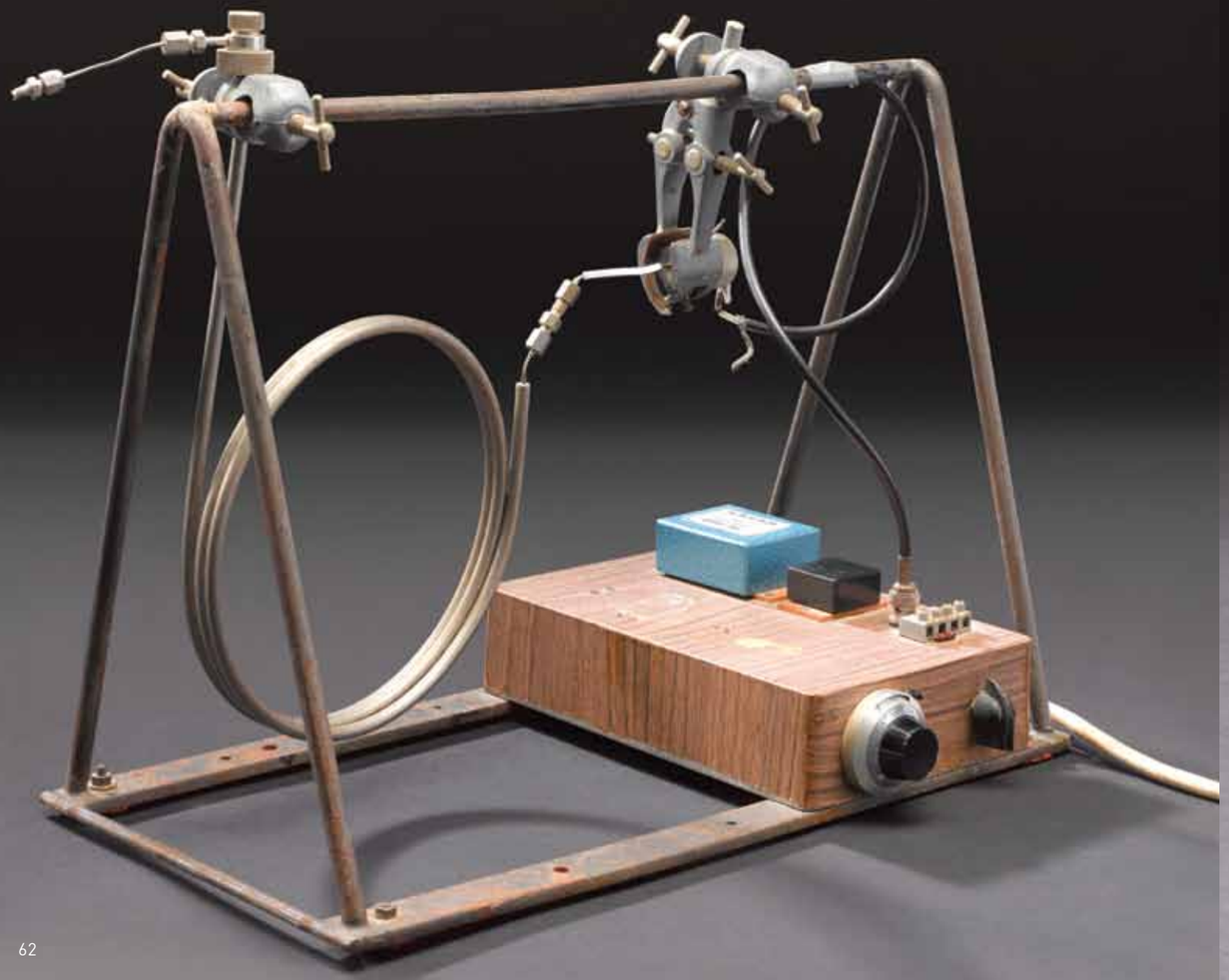
Clockwise: Professor Stephen Hawking [*centre*] receives a Fellowship of the Science Museum... Christie's auctions contemporary photographs to raise money for Media Space... Juergen Maier, MD of Siemens UK, addresses the annual Business Breakfast at MOSI... Sir Martin Smith [*below right*] toasts Michael G Wilson at his valedictory dinner... Will.i.am visits the Science Museum along with Martina Milburn, Chief Executive of the Prince's Trust

BUILDING THE WORLD'S MOST SURPRISING COLLECTION

Hadrian Ellory-van Dekker, Head of Collections at the Science Museum, explains...

Our collections are the cornerstone of our great Museums – changing and developing over time. Collecting is a dynamic activity. Our curators, by design or responding to those fortunate accidents of donation, strive to secure the objects that best express the historical and the contemporary. Some may seem surprising choices. Here is a selection of those significant and unique and unexpected objects acquired during the past year.

> Acquiring the Lovelock Collection was hugely symbolic because our acquisitions programme had been in decline. Jim's collection contains some challenging material, so for us to acquire it sends an import message to the science community
>
> **IAN BLATCHFORD** SMG DIRECTOR



Opposite: Gas chromatograph used by James Lovelock on board RSS *Shackleton* to measure CFC concentrations, 1972, the year he elaborated his famous, but controversial, Gaia hypothesis

This page: Part of an experiment James Lovelock designed for NASA to see whether detectors would work at the surface atmospheric pressure on Mars

CONTINUED

BUILDING THE WORLD'S MOST SURPRISING COLLECTION

SCIENCE MUSEUM
LONDON

The Professor James Lovelock Archive of 2012 includes the gas chromatograph, 1972, that Lovelock took on board the RSS *Shackleton* expedition to measure CFC concentrations

Confocal laser scanning microscope *c.* 1989, designed by Dr Brad Amos who pioneered this apparatus that has now become standard in the biological sciences

Paul Dirac's doctoral thesis (Science Museum)

Paul Dirac's own copy of his doctoral thesis 'Quantum Mechanics', submitted to the University of Cambridge in 1926. The thesis outlines the first general mathematical theory of the new field of quantum mechanics

The last UK mass-manufactured typewriter produced by Brother Industries Ltd. The Brother CM100 electronic typewriter was donated after manufacture in Ruabon, Wrexham, north Wales, in 2012

An advertising board for a mobile phone repair shop, *c.* 2009, used in Buea, Cameroon, was acquired for the new communications gallery, *Information Age*, which opens in late 2014

Two London Transport posters advertising Science Museum exhibitions, 'Smoke Abatement', 1935, and 'The Empire's Airway', 1936

Punch cards in a tray for the Pilot ACE computer that was built at the National Physical Laboratory *c.* 1950

Communiwell prototype, 2003, a tool for psychotherapy made by drama therapist John Casson; designed to allow clients to represent their own mental states and dynamics by placing small objects on different levels of a five-tier cylindrical structure

Watercolour and pencil drawing by Edward Bawden, 1963, for a mural for the Physics Building, University of Hull. An important example of his abstract work, it depicts an idealised atomic structure

Model (scale 1:25, approx.) of the 1956-designed Bluebird CN7 racing car, by Cherilea UK Ltd *c.* 1960. The actual Bluebird car, driven by Donald Campbell, was made for an attempt on the world land speed record in 1960

MUSEUM OF SCIENCE & INDUSTRY
MANCHESTER

Paul Berry's (1961–2001) archive collection, representing the career of the stop-motion animator whose short film, *Sandman*, was Oscar-nominated. Manchester-based Berry also worked with Tim Burton on *The Nightmare Before Christmas*

Portrait photographs by James Mudd & Son, late 19th century. They complement an existing collection of industrial photographs by one of Manchester's most important Victorian photographers

A rare survival of the archive of a company of iron founders, Forrest & Sym Ltd, *c.* 1882–1997, which also manufactured grenades and gas bombs during the First World War

Blueprints from Mather & Platt, 1941–54. Evidence of the Manchester company's expansion beyond traditional textile machinery to become a multinational company producing sprinklers for fire suppression

Bar of Calvert's Carbolic Medical Soap (date unknown). Developed by Dr Frederick Crace-Calvert, an eminent analytical chemist who linked science to industry and profited from his inventions by producing disinfectant products that sold worldwide

Calvert's Carbolic Medical Soap (MOSI)

A rayon fabric sample from 1948, produced by Courtauld's. After the Second World War experiments with new fibres were an attempt to rejuvenate the British textile industry

Rare examples of UK-produced batteries for home wireless sets, from the time when radio listening was taking off, produced by Chloride Electrical Storage Co., *c.* 1920s

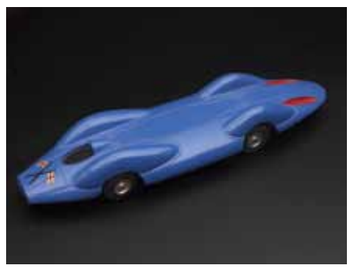
A group of unique documents relating to the world-renowned locomotive builder Beyer, Peacock & Co. Ltd, 1844–1974, collected by former employees and supplementing the official company archive held by MOSI

Equality campaign material from one of the UK's largest and oldest HIV charities, George House Trust, 1996–2011, whose activism continues Manchester's radical traditions

A soft drink bottle, *c.* 1925, that exemplifies how the 20th-century city moved beyond traditional heavy industry into new markets. One such was Tizer, created in Manchester by Fred Pickup in 1924

Last Brother CM100 typewriter (Science Museum)

Paul Berry archive collection (MOSI)



Bluebird scale model (Science Museum)

SELECTED ACQUISITIONS

NATIONAL RAILWAY MUSEUM
YORK

Fifteen-inch gauge model of George and Robert Stephenson's locomotive *Locomotion No. 1*. Probably made for the 50th anniversary of the Stockton & Darlington Railway in 1875 and formerly displayed in a public house in Newton Aycliffe

A 'yellow novel' typically sold at station bookstalls and read by railway passengers, *Baron Montez of Panama and Paris* by Archibald Clavering Gunter, 1893

Photographic negatives and locomotive engineering drawings from the Curl Collection (1850–1969) produced by the London & South Western Railway; London, Brighton & South Coast Railway; South Eastern Railway and the Southern Railway

An 1881 edition of *Bradshaw's Illustrated Handbook for Tourists in Great Britain and Ireland*. Includes information on tours in the manufacturing districts, the English Lake Districts and the Isle of Man

The Ken Nunn photographic collection of 12,000 photographs of railways in Britain, Ireland, France and Belgium (1890s–1960s). From main lines to light railways, they feature significant events and rarely photographed locations

The 'Stephenson family recipe book' containing hand-written culinary, medicinal and household recipes. Probably assembled in the mid-1840s by the cook or housekeeper of George Stephenson and his second wife, Elizabeth

Distant Steam Train, *c.* 1924, a watercolour painting by Christopher Richard Wynne Nevinson, showing a train in a rural landscape

Scale model of the InterCity 250 (NRM)

A 1:20 scale concept model of the InterCity 250 Class 93 locomotive that was intended to run on the West Coast Main Line. The £380 million project was cancelled in 1992 and the rolling stock never made

London 2012 'Time Travel' Olympic Games pin badge, presented to railway staff who volunteered to assist at transport hubs during London 2012

Nameplate from the Virgin Trains Class 57 locomotive number 57309 *Thunderbirds Brains*. Virgin named its locomotives that recovered broken-down trains after characters from the 1960s television series and Brains was the inventor of the *Thunderbirds* vehicles

NATIONAL MEDIA MUSEUM
BRADFORD

The important BBC Collection documents the history of Britain's largest broadcaster and complements existing SMG collections of television and radio equipment to create one of the most extensive collections anywhere in the world. [*See page 25*]

Pye Mk 6 Orthicon television camera, 1963 (NMeM)

Cyanotypes by Nick Veasey, 2011, a British photographer who works primarily with X-ray imaging. Part of a project: 'Plants and flowers are captivatingly beautiful things'

The FotoMan was the first digital camera to go on general sale. The FotoMan Plus model (1992) took higher resolution black-and-white images, 496 x 360 pixels – tiny by today's standards

Two contemporary posters (2011, 2012) acquired to support the NMeM exhibition *Bollywood Icons: 100 Years of Indian Cinema*. Additional evidence of the changing face of Indian cinema

Signed photograph taken in Lesotho in 1960 by Ian Berry, acclaimed photojournalist and member of Magnum Photos. Acquired through the Tyng Bequest within the Royal Photographic Society Collection

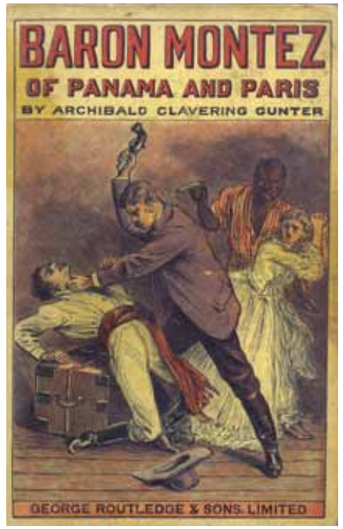
Tom Wood photographs of clubbers at Chelsea Reach nightclub in New Brighton for the series *Looking for Love* (1982–86). We acquired 24 photographs from his first book of the same name

Two cartoons by Thomas Derrick published in *Punch*'s 1933 almanac, satirising the BBC's first television service. They represent an artist's response to television three years before the Alexandra Palace 'high definition' service

A series of John Cura's Tele-Snaps (photographs taken directly from television screens) of the Queen's coronation on 2 June 1953. Unlike film, they provide a crucial record of the coronation as viewed by the live television audience

The Sony XEL-1 OLED television receiver (2008), the first commercial organic light-emitting diode television. The 11-inch screen was the largest flat-screen technology allowed, but produced amazingly lifelike colour images

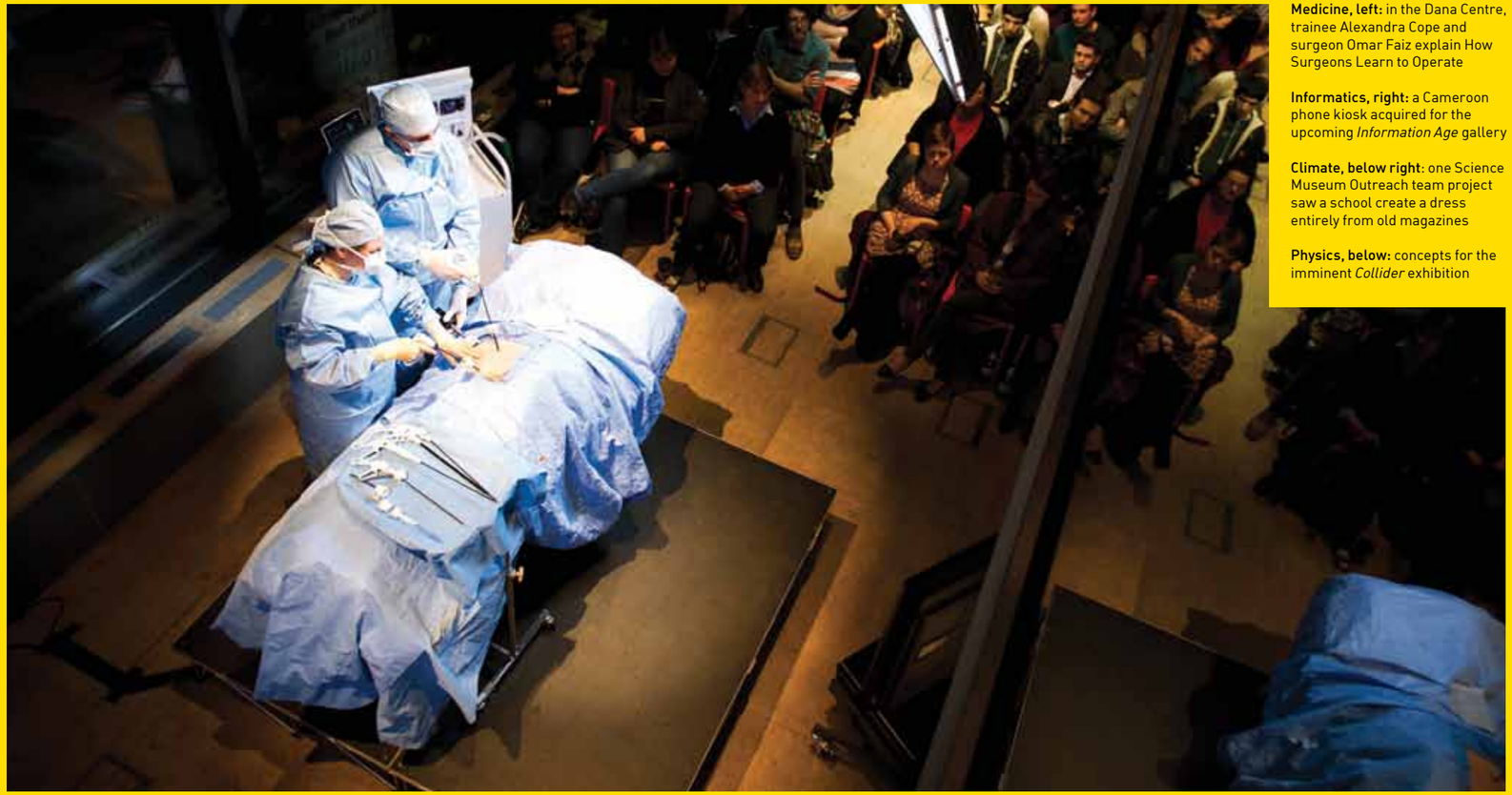
Panasonic transistor television Model TR-005 (1972). Housed in a pearl-grey spaceship cabinet design, it resembled a flying saucer and was officially known as 'The Orbitel'. A 5-inch monochrome set with no provision for batteries



Yellow novel (NRM)

***Thunderbirds* name plate (NRM)**

Bollywood poster (NMeM)



Medicine, left: in the Dana Centre, trainee Alexandra Cope and surgeon Omar Faiz explain How Surgeons Learn to Operate

Informatics, right: a Cameroon phone kiosk acquired for the upcoming *Information Age* gallery

Climate, below right: one Science Museum Outreach team project saw a school create a dress entirely from old magazines

Physics, below: concepts for the imminent *Collider* exhibition

STORY IN A PHONE BOX

The *Information Age* gallery is due to open at the Science Museum in 2014. The project team wanted to explore the use of mobile phones in developing countries and the 'leapfrogging effect' of new technologies over creaking colonial infrastructure. Charlotte Connelly, Content Developer on the project, reports that Cameroon was selected because its mobile industry was booming. A field trip was proposed to collect objects related to telecoms, and these included mobile phone call boxes which act as vital network hubs and retailers of call credit, a novel concept. The most impressive box belonged to Emmanuel Bongsunu, who worked near Ntarikon market in Bamenda. His box tells the story of local history and Emmanuel was very keen to sell it to us so that he could upgrade to a new custom-made box that was specifically designed for his needs now. For us his old, slightly haphazard box bore all the signs of magnificent evolution.

CORE THEMES FOR THE NEXT DECADE

The Science Museum Group neither teaches nor lectures audiences about science because formal education is not our role. Instead we seek to inform and inspire, to convey a rounded view of science, as a story of opportunity, inventiveness and personalities. We show the process of discovery, and help people visualise the work of historical or practising scientists.

Our visitors expect us to explain the scientific process, and how the fertile relationships between traditional science categories such as physics, biology, chemistry, engineering, mathematics and computing can secure a deeper, systematic understanding of our world. Above all, they want us to examine the challenges posed by innovation to the way we live as individuals and society.

The public expects a museum to signify both current knowledge and future discovery. Making choices about our displays, programming and themes for debating the next decade have been much discussed. Each of our Museums has decided its own focus: where choices facing society are urgent, where technology is evolving rapidly, where applications are fundamental. These themes will inform every aspect of their thinking about acquisitions, programming, curation, galleries and education. For the Science Museum in particular the four core strands chosen for the decade to 2022 are:

1 **Climate science and sustainability**, including the challenges of population growth, food and water security and energy sources

2 **The history and future of medicine**, and issues arising from biomedical sciences, neuroscience, synthetic biology and genetics

3 **Informatics (and the science of data)**, mathematics, communication, microelectronic and computing technologies, bioinformatics and the human genome

4 **Understanding the universe**, the enthralling stories of quantum and particle physics, general relativity and cosmology; and of course space technology

The Science Museum wants to show how scientific research translates into the technologies that shape the modern world, and how research might provide solutions to contemporary challenges.

The Science Museum Group is determined to push boundaries, and to raise the prestige and impact of science. This means a strong commitment to scholarship in the history of science, and maximising collaboration with the international scientific community

DR DOUGLAS GURR SMG CHAIRMAN

SCIENCE MUSEUM, LONDON

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

OBJECTIVES

The Science Museum's mission is to make sense of the science that shapes our lives. This commitment drives everything we do. Through our world-class collections, galleries, interactive experiences and our learning programmes we aim to be the leading international museum championing the understanding, enjoyment and prestige of science in modern society.

AUDIENCES

This year the Science Museum welcomed 3.1 million visits, our highest annual total since complete records began. This included a significant increase in the number of overseas visitors and a growing independent adult audience in line with our audience development plan. Our new exhibition *Web Lab* received 200,000 visits and 4.5 million online visits in its first six months.

ACHIEVEMENTS

The Science Museum is a favourite with families: this year 53% of our visitors came in family groups; 13% of our visitors came in education groups and we remain the UK museum with the most recorded visits by this segment. Adults visiting independently make up 34% of our audience. For many visitors to the capital the Museum is a must-visit destination, with 37% of our general admission visitors from overseas and 23% from outside of London and the Southeast.

FUTURE AMBITIONS

Our exhibitions programme planned for 2013 and beyond includes *Collider* (on the Large Hadron Collider, autumn 2013), *Cosmonauts* (on the Russian space programme, 2014), a collections-based exhibition on climate change (2014). Media Space will open in 2013 and the *Information Age* gallery in 2014, followed by major improvements to the *Mathematics* gallery, medical galleries and our non-gallery public spaces, in line with our Masterplan. We want to be the UK's leading centre for the public history of science, technology and medicine and advocacy. To this end we are developing an e-journal for our research outputs and a publications series promoting our collections.

We will further extend our reach nationally and internationally by both hosting and touring major temporary exhibitions.

Inkjet printed iPad drawing on paper of Stephen Hawking, by David Hockney, 2012 (unsigned). Commissioned as an iPad drawing by the Science Museum. © David Hockney

MUSEUM OF SCIENCE & INDUSTRY, MANCHESTER

Director: Jean Franczyk
Museum of Science & Industry
Liverpool Road, Castlefield
Manchester M3 4FP
www.mosi.org.uk

OBJECTIVES

The Museum of Science & Industry's mission is to explore the place where science met industry and the modern world began, and to understand the impact that Manchester science, technology and innovation continue to have on all our lives. We aim to be internationally recognised for our creative exploration of how these things created and sustain modern society.

Daily demos in the *Textiles* gallery: speed frames draw and twist cotton into slivers so it can be spun into thread

AUDIENCES

In 2012–13, 642,000 people visited the Museum. Our February half-term programme, Steam, Sweat and Sewers, attracted 30,000 visitors. The Manchester Science Festival, produced by the Museum, attracted 86,000 visits to exhibitions and events across Greater Manchester. As part of the Festival, we commemorated the centenary of Alan Turing by inviting people to take part in a mass experiment, which generated the largest-ever data set about the mathematical patterns of sunflowers.

ACHIEVEMENTS

This year 63% of those visiting the Museum came as a family group, with a significant proportion visiting regularly in order to take part in our programme of family-friendly events and activities. Independent adults made up almost 27% of overall visitor numbers and the remaining 10% came in educational groups. Among general admissions visitors, 80% come from Greater Manchester and the Northwest region, with a further 14% from elsewhere in the UK and 6% from overseas. The STEM programme has placed ambassadors in 140 schools in Greater Manchester.

FUTURE AMBITIONS

In line with the Masterplan development, we have been fitting out an interim temporary exhibition space to house *Brains: The Mind as Matter* on tour from the Wellcome Collection. We will also improve the main Welcome and Entrance to the Museum. A new exhibition to highlight the collection and curated by the Museum is also planned.

NATIONAL RAILWAY MUSEUM, YORK AND SHILDON

Director: Paul Kirkman
National Railway Museum
Leeman Road
York YO26 4XJ
www.nrm.org.uk

OBJECTIVES

The National Railway Museum comprises the main museum in York with two large exhibition halls based in former railway depots, and a second museum in Shildon, County Durham, which was opened in 2004. The NRM in Shildon is operated in partnership with Durham County Council. It houses more of the National Collection in a new building and a historic site around the 19th-century former workshop of Timothy Hackworth.

Our mission is to enable people to explore the story of railways as an innovative form of transport and how they fit into that story. A series of memorable gallery, interactive, web and learning experiences tell the story of railways past, present and future. The NRM is the world's premier railway museum.

Paul Kirkman took over as Director of the Museum in November 2012.

AUDIENCES

This year we attracted 727,000 visits to the Museum in York and 203,000 to Shildon, while in June 34,000 visited Railfest alone. The Museum in York continues to appeal successfully to family groups, which make up 56% of visitors. Independent adults account for 38% of visitors, whilst 6% come in education groups. The Museum is a particular attraction for railway enthusiasts and their families, who make up 21% of general admissions visitors, but the majority of visitors are not specifically railway enthusiasts.

ACHIEVEMENTS

In December we cemented our relationship with the Railway Museum in Saitama, Japan, with the signing of a sisterhood agreement. Two A4 locomotives came from Wisconsin and Montreal for conservation in Shildon in preparation for this year's anniversary of *Mallard*'s world record.

FUTURE AMBITIONS

To mark the 75th anniversary of *Mallard*'s breaking the speed record as the fastest steam locomotive in the world, the Museum is reuniting all six surviving A4 locomotives with a programme of celebrations. We are delighted that HRH The Prince of Wales has agreed to be our patron for this series of events.

Sans Pareil, one of the earliest surviving steam locomotives, was built in *c.* 1815 by Timothy Hackworth and took part in the 1829 Rainhill Trials. The original is displayed at Shildon

NATIONAL MEDIA MUSEUM, BRADFORD

Head of Museum: Jo Quinton-Tulloch
National Media Museum
Pictureville
Bradford BD1 1NQ
www.nationalmediamuseum.org.uk

OBJECTIVES

Our mission is to help our audiences explore and understand the social and cultural impact of communications media in all their forms. We aim to be the best museum in the world for inspiring people to learn about, engage with and create media.

Jo Quinton-Tulloch took over as Head of Museum in September 2012.

AUDIENCES

This year the Museum attracted 493,000 visits, of which 35,000 were recorded during the February half term programme of activities inspired by the popular children's book character Horrid Henry. A major attraction for visitors to the Museum this year was *Life Online*, the world's first permanent gallery dedicated to the social, cultural and technological impact of the internet.

ACHIEVEMENTS

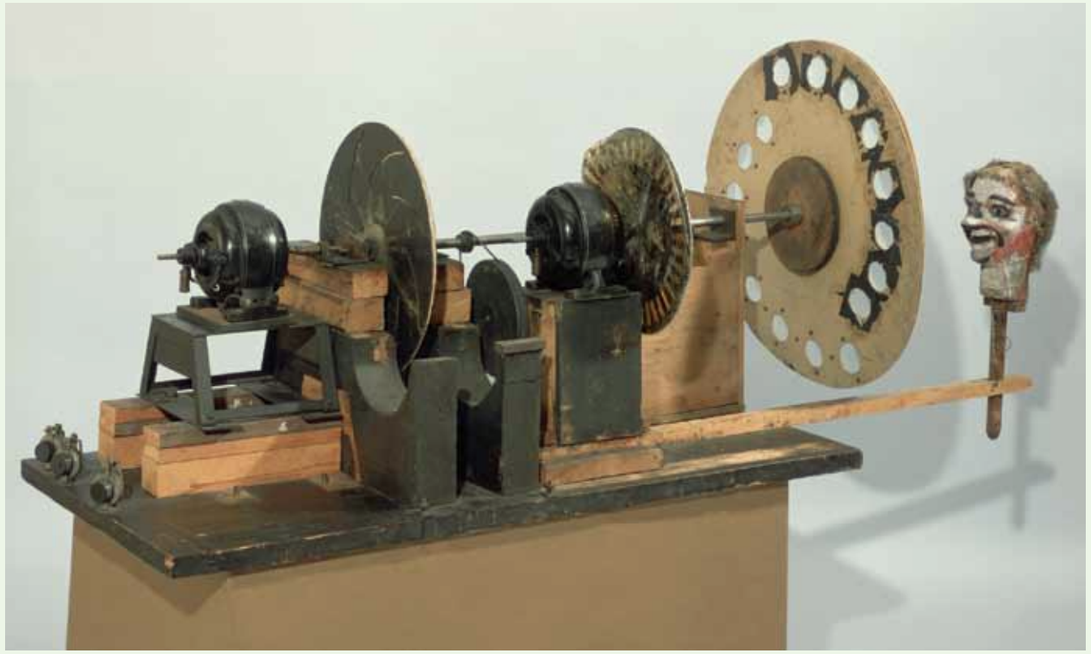
The Museum has two broad audiences: those who visit primarily for the galleries and exhibitions, and those who visit mainly for the full-length film programme. This year 77% of all our visitors came for the former, whilst 23% came for the latter. Of the visits motivated by the galleries and exhibitions, 63% of visitors came in family groups and 25% were independent adults, with a further 11% coming in education groups.

Our independent adult visitors come to see interesting objects, learn and have a culturally engaging experience. The Museum as a whole is an important attraction and resource for communities in Yorkshire and the Humber, with 73% of our general admissions visitors coming from the region.

FUTURE AMBITIONS

In September 2013 SMG will open Media Space at the Science Museum in London. Major exhibitions curated by the National Media Museum to showcase the National Photography Collections will be launched in London and then transfer to the Museum in Bradford. We will also be working with the British Film Institute to complete the Yorkshire Mediatheque project, which will enable a selection from our existing *TV Heaven* offer to be incorporated into the BFI Mediatheque and made available more widely. From June 2013 we are marking our 30th birthday with special events.

In line with the core mission of SMG, the National Media Museum will be making a significant shift to focus more on inspiring the nation's interest in science and engineering and the challenges posed by innovation.



John Logie Baird's original mechanical apparatus for transmitting television pictures, built in 1925

OUR GENEROUS SUPPORTERS

SPONSORS AND DONORS

Science Museum

Accenture

AHRC (Arts and Humanities Research Council)

Anaesthesia, Journal of the AAGBI
Jonathan Anderson and Edwin Low
ARM Holdings plc
The Art Fund
Arts Council England

The Association of Anaesthetists of Great Britain and Ireland

Association of Paediatric Anaesthetists of Great Britain and Ireland

Bank of America Merrill Lynch
Barclays Group
Bayer plc
Virginia Beahan and Laura McPhee
Bonni Benrubi
BG Group plc
BP
British Journal of Anaesthesia
The British Pain Society
The British Psychological Society
BT Group plc
Edward Burtynsky
Christie's
City Bridge Trust
Dr Ann Coxon
Daniel Craig
Creative Artists Agency

Dana and Albert R Broccoli Foundation

Darbyshire

The David and Claudia Harding Foundation

Luc Delahaye
Dame Judi Dench
Rineke Dijkstra
EADS
The Eranda Foundation
The ExPat Foundation
Eric and Louise Franck
Gang, Tyre, Ramer & Brown Inc.
Philippe Garner
Howard Greenberg
Paul Haggis
Haier UK and Ireland
Hamiltons Gallery

The Harry and Florence Sloan Foundation

Heritage Lottery Fund
Paula and Robert Hershkowitz
Paul Hertzmann and Suan Herzig
Michael and Mercedes Hoffman
James Hyman, London
Hyundai Motor UK Ltd
Independent Talent Group

The Institution of Engineering and Technology

Kenny and Jenny Jacobson

Johnson Matthey plc

The Keniston-Cooper Charitable Trust

The Kusuma Trust UK
Richard Learoyd
Dr Sara Levene
Life Technologies Foundation
George and Angela Loudon
Alan and Virginia Lovell
MasterCard
Sam Mendes
Michael Hoppen Gallery
Motorola Solutions UK Ltd
Obstetric Anaesthetists' Association
Otto Bock Healthcare plc
Sean Phelan and Audrey Mandela
Rose Gallery
Royal Academy of Engineering
The Royal College of Anaesthetists
Lise Sarfati

Science & Technology Facilities Council

Shell International
Siemens plc
Taryn Simon
Jem Southam
UK Friends of the Science Museum
US Friends of the Science Museum
Geoff and Liz Varrall
Virgin Media
Visa Europe Services Inc.
Wellcome Trust
Mr and Mrs Michael G Wilson
The Winton Charitable Foundation

All the individuals who contributed whilst visiting the Museum

Miscellaneous company donations

Legacy donors

Those who have made gifts in memory of friends and family

Science Museum volunteers

All those who wish to remain anonymous

Museum of Science & Industry

The Estate of Ken Andrews
Glitterfish
Granada Foundation
Institute of Physics
Kirby Laing
The Midland Hotel, Manchester
The Estate of Alan Morris
NEC Display Solutions
Oglesby Charitable Trust
Renold plc
RSA NW Venture Fund
Siemens
United Utilities
University of Salford
Waters Corporation
Winton Capital Management
Zochonis Charitable Trust

All the individuals who contributed whilst visiting the Museum

Miscellaneous company donations

MOSI volunteers

All those who wish to remain anonymous

National Railway Museum

Atlantic Container Line
Bachmann Industries Europe plc
Bauer Media
Richard Boaste-Kelly
John C Bysouth
Canadian National Railway Company
CERES Global
Leopold de Rothschild
Mr and Mrs Arthur William Downham
East Coast
Eversholt Rail Ltd
First Great Western
First Transpennine Express
Freight Transport Association
Grand Central Railway Company Ltd
The Gresley Society
Hallet Steam Oils
Hornby plc
Jeremy Hosking
Maximus Augustus Xavier Lachman
Samson Alexander Marcus Lachman
Life Environmental Services
Merseytravel
Nicholas Millward
Alan E Moore
Moveright International Ltd
Network Rail
Derek Newth
Northern Rail
Peel Ports
Siemens plc
T&R Williamson
Tata Steel Projects
TTX
W L Pratt Charitable Trust
Wabtec Rail Ltd
Williamsons Ltd

The many individuals who have contributed to the Steam Our Scotsman appeal, the restoring Deltic 55002 appeal and the Station Hall appeal

All the individuals who contributed whilst visiting the Museum

Miscellaneous company donations
Legacy donors
NRM York volunteers
NRM Shildon volunteers

King's Own Yorkshire Light Infantry volunteers

All those who wish to remain anonymous

National Media Museum

ANKAMA
Black Sheep Brewery

The Boris Karloff Charitable Foundation

British Film Institute

City of Bradford Metropolitan District Council

The Clothworkers' Foundation
Coutts & Co.
Creative England
Esmée Fairbairn Collections Fund
Grand Central Railway Company Ltd
Heritage Lottery Fund Yorkshire
JCT 600 Ltd
Jurys Inn
Kudlian Software
Laser Hotline
Tom March
Media World Logistics
Robert Moorley
Multibrands International Ltd
Northern Film School / Leeds Metropolitan University
Northern Rail

Ray and Diana Harryhausen Foundation

Screen Yorkshire
Spellman Walker
Toon Boom
University of Bradford
Virgin Media
Mr and Mrs Michael G Wilson
Yorkshire Forward

All the individuals who contributed whilst visiting the Museum

Miscellaneous company donations

Members of the National Media Museum

NMeM volunteers

All those who wish to remain anonymous

CORPORATE MEMBERS

Science Museum

Lovelace Laureate
GlaxoSmithKline

Archimedes Alliance
Bloomberg LP
Rentokil Initial plc

Faraday Fellowship
CMS Cameron McKenna
Smiths Group

Curie Circle
Mathys & Squire LLP
ReAgent
Tranter Lowe
Wire: Broadcast Ltd

National Railway Museum

Platinum
Rail Media Group

Gold
Central Japan Railway Company
Friends of the NRM
West Coast Railways
West Japan Railway Company

Silver
Bachmann Industries Europe plc
East Coast

Bronze
Abellio Group
Honeywell Control Systems Ltd
Keolis
Omnicom Engineering Ltd

Community
The Flour Mill
Milburns
REPTA
Shepherd Group
Stately Trains

National Media Museum

Dimbleby
Freemans Grattan Holdings
Schofield Sweeney Solicitors LLP

Peel
Hallmark plc

Cerf
Bradford College
Rex Procter & Partners
Turn Key
Universal AV Services
Yorkshire Building Society

Cameron
Approach PR Ltd
Catapult Films
Cloud2 Ltd

PATRONS

Science Museum

Brunel Circle
Toby Anstruther
Iain Bratchie
The Lord Browne of Madingley
Dr Ann Coxon
Edwina Dunn

Mr Andrew Eland and Dr Pascale Hazel

John and Elaine Elkington
Alexander and Ika Green
Andrew Jackson
George and Angela Loudon
Alan and Virginia Lovell
Jeremy Oppenheim
Alexandra Papadakis
Guy Reid

Lord and Lady Waldegrave of North Hill

Gregg Wilson

Einstein Circle
Dr Douglas Gurr
Mercedes and Michael Hoffman
Dr K T Lalvani
Dr Sara Levene
Sean Phelan and Audrey Mandela

Galileo Circle
The de Laszlo Foundation

Newton Circle
Mr and Mrs Donald Brydon

The David and Claudia Harding Foundation

Mr and Mrs Michael G Wilson

All those who wish to remain anonymous

National Railway Museum

Duchess Circle
Alan E Moore
Andrew Scott

Rocket Circle
William R Adam
Richard Harper
Derek Langslow
Peter J Mosse
Ray Price
Rodney B Wilson

Scotsman Circle
Ian Macbeth
Harry Medcalf
Neil Millington
Francis Townend

All those who wish to remain anonymous

MAJOR ACQUISITIONS: LOVELOCK SUPPORTERS

James Lovelock is one of the most significant and influential scientists of our time. His personal archive and scientific collection – a rich record covering 70 years of scientific inquiry, investigation, discovery and invention – now has the permanent home it deserves, as the Science Museum purchased this archive in 2012. The Museum is now working on cataloguing the archive and making it fully accessible to visitors.

Professor James Lovelock himself said: 'I am delighted that the Science Museum has chosen to purchase this collection and I hope that it will show the next generation how it is possible to do scientific research as a lone inventor and scientist. I attribute the science I have done to the inspiration I received from visits to the Museum from the age of seven onwards.'

The purchase of the archive relied on the generous support of the public and the companies, foundations and individuals listed below:

Dr Yumi Akimoto
Ian Blatchford
Howard and Veronika Covington
Dr Ann Coxon
Dr Blair Feltmate
The de Laszlo Foundation
John Gilbert
Dr Douglas Gurr
Kiyo Inc.
Knut Kloster
Dr Lalvani
George and Angela Loudon
Alan and Virginia Lovell
The Neukermans Family Trust
Oak Foundation
Dame Vivienne Westwood
All those who wish to remain anonymous

BECOME A PATRON

Many of our individual supporters choose to help us through Patronage. Becoming a Patron is a hugely important way of supporting the work of our Museums, helping us to create ambitious displays and educational programmes, and to protect our world-class collections for future generations. In recognition of their support and generosity, our Patrons enjoy special access to our collections and to a tailor-made programme of exclusive events including behind-the-scenes tours, opening receptions, dinners and talks by our expert curators.

To find out more about becoming a Patron of the Science Museum, please contact us on 020 7942 4335 or e-mail **patrons@sciencemuseum.ac.uk**

To find out more about becoming a Patron of the National Railway Museum, please contact us on 01904 685774 or e-mail **development@nrm.org.uk**

WHERE FUNDS COME FROM

Fundraising at the Science Museum Group is based on developing long-lasting and mutually beneficial relationships with all our funders. We view supporters as investors in our ambitions and values and we hold varied events to grow their interest in our Museums.

Individual donors play a significant role at SMG. They recognise the importance of inspiring the next generation and the unique role we play in achieving this.

Our Corporate sponsors support us across a range of galleries and exhibitions and in return we offer a bespoke range of tangible benefits to meet their needs.

Grants from private trusts, foundations and Government help SMG to share learning expertise. Many grant-giving bodies are experts in education, heritage or wider public engagement and the benefits are usually mutual.

Visitor giving is one of our newest income streams, generating much-needed unrestricted funds by asking visitors to make a voluntary donation while they are in our Museums.

A RENOWNED FAMILY OF MUSEUMS

Trustees of the Science Museum Group at the Annual Dinner

SCIENCE MUSEUM GROUP PURPOSE

The Science Museum is the lead partner in the Science Museum Group, the world's most significant museum group devoted to science and engineering. The Group also encompasses the National Railway Museum in York (created in 1975), the National Media Museum in Bradford (1983), the National Railway Museum in Shildon (2004) and the Museum of Science & Industry, Manchester (which joined the Group in 2012). Together these Museums recorded 5.1 million visits in 2012–13, and over 20 million unique website visits too. The common bond between all the Group's component parts is the story of human ingenuity in the fields of science, technology, medicine, transport, media and the development of the modern city.

THE CHARITY

The Board of Trustees of the Science Museum was established under the National Heritage Act 1983. SMG is an exempt charity under the Second Schedule of the Charities Act 1994.

The Science Museum Group comprises:

Science Museum, London
Museum of Science & Industry, Manchester
National Railway Museum, York and Shildon
National Media Museum, Bradford
SCMG Enterprises Ltd

BOARD OF TRUSTEES OF THE SCIENCE MUSEUM GROUP

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 DCMS. The Director of SMG, as Chief Executive Officer, is responsible to the Board of Trustees and, as Accounting Officer, is accountable to DCMS for compliance with the Management Statement and Financial Memorandum.

Chairman
Dr Douglas Gurr

Members
Lady Chisholm
Mr Howard Covington
Professor Dame Athene Donald DBE
Lord Faulkner of Worcester
Mr Andreas Goss
Lord Grade of Yarmouth CBE
Professor Ludmilla Jordanova
Mr Simon Linnett
Professor Averil Macdonald
Professor Sir Howard Newby CBE
Dr Gill Samuels CBE
Mr James Smith CBE
Ms Janet Street-Porter
Mr Chris Swinson OBE
Mr Peter Fell (observer for MOSI)

OUR DISTINGUISHED ADVISERS

Science Museum Advisory Board

Chair: Dr Gill Samuels CBE (Trustee)
Ms Jane Atkinson, from 30 April 2012
Dr Sarah Caddick
Professor Dame Athene Donald DBE (Trustee)
Professor Marcus du Sautoy
Mr Malcolm Garrett
Dr Lucie Green, from 30 April 2012
Sir Tim Hunt
Professor Ludmilla Jordanova (Trustee)
Ms Clare Matterson
Professor Michael J Reiss
Professor Simon J Schaffer

Museum of Science & Industry Advisory Board

Chairman: Lord Faulkner of Worcester (Trustee), until 31 March 2013
Professor Colin Bailey
Dr Maria Balshaw
Mr Michael Emmerich
Mr Peter Fell (Vice-Chairman)
Mr Steve Johnson, from 10 August 2012
Sir Richard Leese CBE
Mr Robert Owen MBE
Ms Sinead Rocks
Dr Gill Samuels CBE (Trustee)
Ms Susan Woodward OBE

National Railway Museum Advisory Board

Chairman: Professor Sir Howard Newby CBE (Trustee)
Mrs Gillian Cruddas MBE
Lord Faulkner of Worcester (Trustee), until 31 March 2013
Mr Christopher Garnett OBE
Mr Bryan Gray CBE
Mr Brian Greenwood
Mr Simon Linnett (Trustee)
Ms Sue Palmer OBE, until 7 February 2013
Mr Frank Paterson MBE, until 7 February 2013
Mr Adrian Shooter CBE
Mr Anton Valk, from 6 November 2012
Mr Philip Verster
Mr William Woolley

National Media Museum Advisory Board

Chairman: Lord Grade of Yarmouth CBE (Trustee)
Mr Simon Beaufoy, until 31 January 2013
Mr Pierre Brahm
Lady Chisholm (Trustee)
Mr Philippe Garner
Mr Matt Locke
Ms Zahida Manzoor CBE
Mr Roger Mosey
Dr Annette Nabavi
Mr Simon Norfolk
Mr Tony Reeves
Ms Carolyn Reynolds
Ms Gillian Reynolds MBE

SMG VISIT NUMBERS 2012–13

Total number of visits to the Museum (excluding corporate hire)	Science Museum	Museum of Science & Industry	National Railway Museum	NRM Shildon	National Media Museum	All Science Museum Group
Outturn 2011–12	2,922,000	839,000	630,000	210,000	483,000	5,171,000
Outturn 2012–13	**3,084,000**	**642,000**	**727,000**	**203,000**	**493,000**	**5,149,000**

Visits by all visitors in educational groups	Science Museum	Museum of Science & Industry	National Railway Museum	NRM Shildon	National Media Museum	All Science Museum Group
Outturn 2011–12	408,570	63,440	40,614	71,067	44,415	628,106
Outturn 2012–13	**400,000**	**64,000**	**40,000**	**61,000**	**42,000**	**607,000**

Information is sourced through both internal records and periodic independent visitor surveys. There has been no change in the method of calculation this year compared with previous years for the Science Museum Group.

– NRM and MOSI each attracted more visits last year than Tate Liverpool.
– NMeM attracted more visits last year than York Minister or Jorvik.
– In addition to our schools audience, 60% of general visitors to the Science Museum and NRM come in family groups and 70% of NMeM and MOSI general visitors come in family groups.
– Every year more than 1.8 million children visit one of the SMG museums, including 1 million to the Science Museum alone.

GROUP FINANCIAL SUMMARY 2012–13

The Science Museum Group continued to benefit from the generous support of sponsors, trusts, foundations and individuals during 2012–13, all of whose contributions helped our Museums to deliver a wide range of programmes, from major capital projects and innovative contemporary science displays to our work with schools and popular late-night openings. The support of our visitors has been overwhelming over this past year, with income from visitor donations up 64% compared with our budget. In these difficult economic times, this support is more critical than ever. Without it we would struggle to continue to achieve the extraordinary range and depth of activities our Museums continue to deliver.

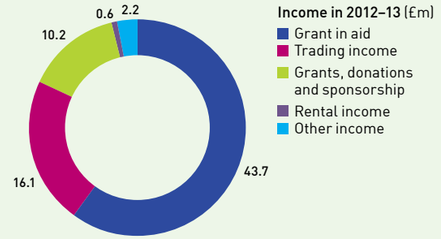
Because 2012–13 was the first full year in which MOSI has been part of our Group, there was an increase in both Government funding and in operating costs compared with the year of acquisition. In real terms, our Government grant has again fallen this year, and the years ahead look to become ever more challenging.

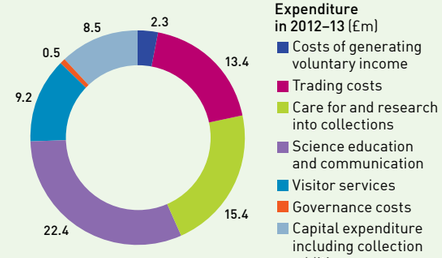
In order to meet the continuing reductions in Government funding, SMG has continued to cut costs and to realise efficiencies, through procurement, rationalisation of storage facilities and a reduction in staff numbers. We have succeeded in balancing our budgets without compromising on either visitor experience or the care of our collections.

Despite the reductions in our Government funding, we have been able to raise funds to continue with two major capital projects, both of which have been generously funded by sponsors. Among other uses, the Media Space galleries will showcase our photographic collections from September 2013. *Information Age*, a major new gallery on communications, will open in autumn 2014.

We have as a Group become more strategically focused, leaner and more efficient, but if public funding continues to fall and economic uncertainty persists we may have to review the scale and range of our operations. Even in the most difficult of circumstances, however, we will endeavour to ensure as many people as possible can enjoy our remarkable collections.

These figures are extracted from draft financial statements. The full Annual Report and Accounts is available on our website: ***sciencemuseum.org.uk/group***





TAKE A NOTE, MR PEPYS – CERTAINLY, YOUR MAJESTY

This spectacular diorama was despatched last summer to storage during the decant of 1800 objects from the shipping galleries at the Science Museum to make way for the new *Information Age* gallery. Titled 'Model of Admiralty Boardroom, presenting 1677 Thirty-Ship Shipbuilding Programme', it is the size of an office desktop and was crafted in the Science Museum workshops in 1960, when television was still a novelty, following a long tradition of museum displays. (You may still find other brilliant dioramas in the *Agriculture* gallery and in Wellcome's *Glimpses of Medical History* gallery.)

Just relish the artistry, from the exquisite joinery and costume details to the manikins acquired from a Miss B M Campbell of Hampton Wick. Their faces look drawn from historic portraiture on the figures of King Charles II [*far right*] and the renowned diarist Samuel Pepys as his Admiralty Secretary [*left with quill*]. And, oh, the deference of the whole group in an era when only a cat may look at a king!

The moment captured here is a watershed in British naval history. A typical meeting of the Admiralty Board is discussing, with the aid of a scale model prototype (a 2nd-rate man-of-war), the dimensions of a warship being built in the Thirty-Ship Shipbuilding Programme of 1677. This was the first such Royal Navy initiative based on standardised designs.

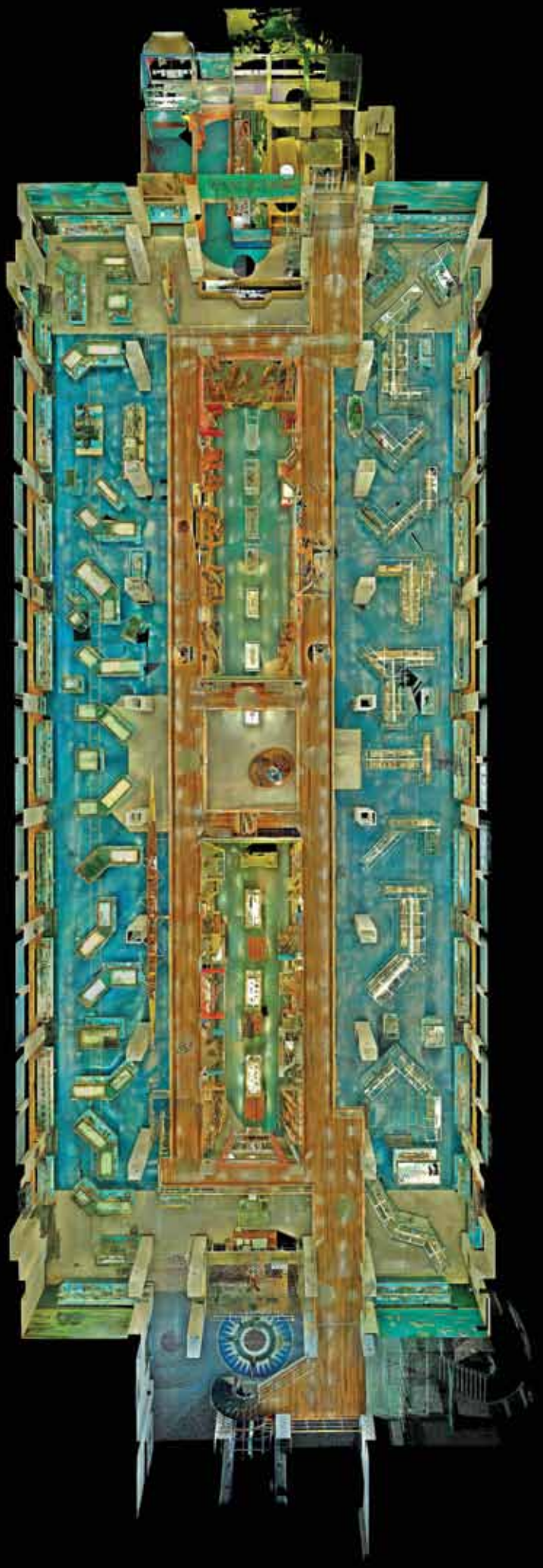
Anticlockwise from the king's right hand: Prince Rupert, Sir Anthony Deane (Master Shipwright and Commissioner, Portsmouth Dockyard), Sir Joseph Williamson (a Secretary of State), Sir John Tippetts (Surveyor, Portsmouth Dockyard), Samuel Pepys, the Duke of Ormonde. As key members of the Navy Board, Deane and Tippetts are providing specialist construction advice.

BON VOYAGE, IN A 3D RUSH

The Science Museum's *Sailing Ships and Small Craft* gallery was designed like a cruise liner on two levels for its opening in March 1963. It provided the focus for a group of galleries devoted to maritime themes – steamships of war, merchant steamers, marine engineering, docks, diving and navigation – which became known familiarly as the shipping galleries. Before being decommissioned in 2012 to make way for the *Information Age* gallery, due to open in 2014 to celebrate communications technology, the space was scanned in 3D by lasers.

This cutting-edge process uses millions of laser pulses to measure the exact surface of the gallery contents and exhibition layout. More than 1 billion precisely measured points make up an exact digital replica of the gallery space which is now preserved for ever in full colour and can be explored by a new generation of virtual gallery visitors. The scanning technology was rendered by ScanLAB Projects in a collaboration with UCL.

At right we see a simple plan view, but the real treat is an exhilarating fly-through generated as a video by ScanLAB. It can be viewed online at: **sciencemuseum.org.uk/shipsvideo**



"The Science Museum is a magical gateway into the world of awesome beauty and complexity that science reveals. I have never been able to resist the temptation to go exploring there

HOWARD COVINGTON
SMG TRUSTEE AND INVESTMENT BANKER

> It is vital that scientific discoveries and innovations are recognised and communicated to society in a way that validates the important role they play in our daily lives. The Science Museum's Great British Innovation Vote was a perfect example of how this can be done in a unique and creative way

PROFESSOR STEPHEN HAWKING
THEORETICAL PHYSICIST AND AUTHOR

> Museums do more than entertain and teach, they also open people's eyes to career opportunities. The Museum we're in today is a great illustration

ERIC SCHMIDT
GOOGLE'S EXECUTIVE CHAIRMAN LECTURING AT THE SCIENCE MUSEUM

> The quality and scale of the National Media Museum photographic collections is truly sensational

MICHAEL G WILSON
CHAIRMAN OF THE SCIENCE MUSEUM FOUNDATION

> Science and technology must help us create a more sustainable world. With that aim, the museums of the Science Museum Group combine to excite us, inform us and provoke us

JAMES SMITH
SMG TRUSTEE

Edited by David Johnson
with generous input from staff at SMG
and its many bloggers

Designed by Andy Spencer Design
and the Science Museum Design Studio

Project manager, Lauren Reid
Picture researcher, Nick Hedley
Editorial assistant, Pippa Murray
Copy editor, Lawrence Ahlemeyer

Main photography from Group resources:

Climate Science Outreach Project
Museum of Science & Industry
National Media Museum
National Railway Museum/Pictorial Collection
Science & Society Picture Library
Science Museum Library & Archives
Science Museum Photographic Studio

With thanks for additional photographs by:

Sarah Ainslie, Tim Anderson,
Ant Clausen Photography Ltd, Kasim Asim,
Bletchley Park Trust/SSPL, Charlotte Connelly,
English Touring Opera, David Exton, Sue Fisher,
Tony French, Robert Griffin, Maggie Harte,
Tim Hawkins, Jennie Hills, Johnrussell.zenfolio.com,
Leo Johnson, Chris Lobina, Eamonn McCabe,
Andrew McCaren, Barry MacDonald,
Kippa Matthews, Miraikan Museum, Thomas Stephen
Myrddin-Baker, Nature Publishing Group,
Marizu Okereke, Sam Potts, Press Association,
Ross Parry Agency, ScanLAB Projects,
Sjoerd Epe Sijsma, Duncan Soar, Will Stanley,
Swindon Commercial Services, Paul Thompson,
UNICEF, WeSET, Tom Whipps, Robert Workman

Printed by Falkland Press, Hatfield, using sustainable paper – Cocoon Silk 100, which is produced from 100% post-consumer recycled, FSC certified pulp. Less energy and water are consumed and fewer CO_2 emissions are produced during manufacturing, compared with the production of virgin fibre paper. FSC recycled certification, NAPM 100% recycled certification, ISO 14001, Process Chlorine Free (PCF) and PAS 2020:2009 Level 3.

OUR FIVE WORLD-BEATING MUSEUMS

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

HOW TO DONATE

Each Museum in the Science Museum Group is recognised as a charity by HM Revenue and Customs. Our Revenue & Customs tax exemption number is **XN63797A**. At any of our Museums' websites (see pages 68–71) enter the word 'Donate' into the search engine. To learn about the different ways to support us, telephone **+44 (0)20 7942 4045** or e-mail **patrons@sciencemuseum.ac.uk**

Cover picture: Musician will.i.am visiting *Web Lab* at the Science Museum in London to launch new Prince's Trust workshops for 13- to 19-year-olds, which will be run in partnership with the Science Museum in schools across the country. Photograph by Jennie Hills