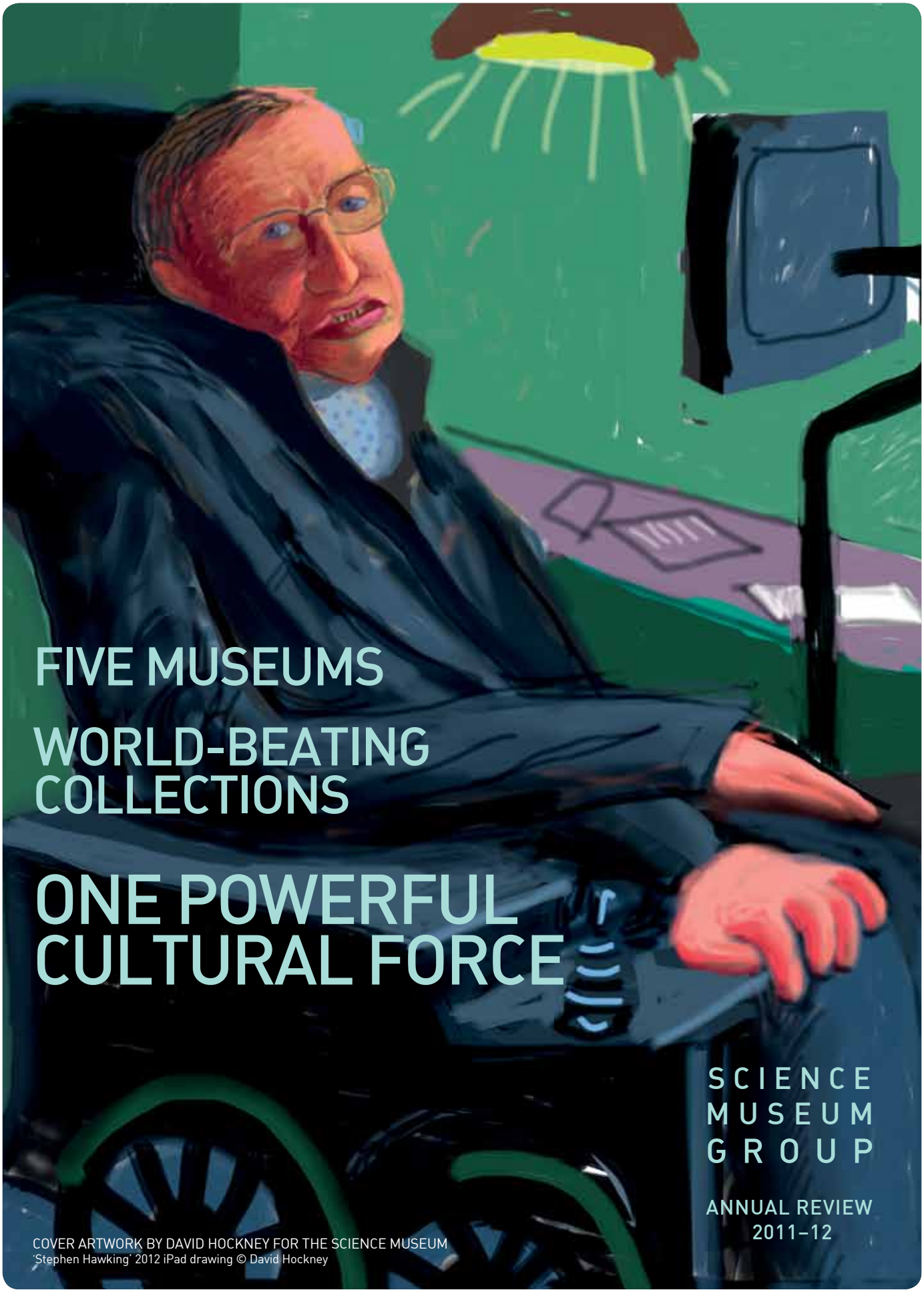


FIVE MUSEUMS

WORLD-BEATING COLLECTIONS

ONE POWERFUL CULTURAL FORCE

SCIENCE MUSEUM GROUP

ANNUAL REVIEW 2011–12

COVER ARTWORK BY DAVID HOCKNEY FOR THE SCIENCE MUSEUM
'Stephen Hawking' 2012 iPad drawing © David Hockney

A new champion
for science and innovation

Dr Douglas Gurr, the Chairman of the Science Museum Group, explains the thinking behind this review, which celebrates recent achievements across our five museums.

The Annual Review gives a snapshot of activity across the Group during the past financial year. It should not be confused with the formal Annual Report and Accounts which are produced for Parliament. Most of the great art museums produce an advocacy document such as this and we felt it was about time that we joined them, by celebrating our work and achievements in a lively fashion.

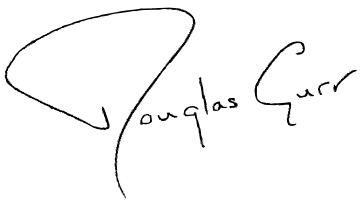
I should explain that we used to be called the National Museum of Science & Industry (NMSI) but almost everyone found the name confusing and rather meaningless, especially as it did not reflect the fact that we are an unrivalled alliance of five UK museums, attracting more than 5 million visits a year and 16 million online. We also care for one of the greatest museum collections in the world, over 7.3 million items at the last count. All this amounts to a powerful cultural force.

Now in his second year, our restless new Director, Ian Blatchford, is getting into his stride. On page 4 you can read his manifesto in which he voices his radical response to the public's burgeoning appetite for making sense of the latest ideas in science, technology, engineering and medicine. But this is a vision shared fully by the Board of Trustees, the eminent scientists and scholars who sit on our advisory boards, our volunteers, our patrons and supporters, and the 800 people or more employed throughout the Group.

We are 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.

Achieving these ambitions will require serious fundraising, and partnerships with the leading companies, foundations and government agencies promoting science.

We are sending this document to all those friends and supporters who are passionate advocates for a more science-minded future.



Chairman, Science Museum Group

Contents

'Museums do more than entertain and teach, they also open people's eyes to career opportunities. The Museum we're in today is a place to inspire'
– Eric Schmidt, Google's Executive Chairman, speaking at the Science Museum

Serious, ambitious, determined: our five museums are moving up a gear

By Ian Blatchford, Director, Science Museum Group

It's 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 technology. The Group should flourish as a flagship for the best that a rational explanation of our world can offer; and that power lies in our collections, experience, research and reputation for integrity. We need to be entrepreneurial and extrovert. To achieve this, the following essential themes will underpin the next decade and are reflected in the coming pages.

1 The Group must push its audiences harder. So we are ditching the commercial 'science-light' special exhibitions of the past decade, to focus on real science. Our audiences are more sophisticated than we've given them credit for, and we don't need to choose between accessibility and excellence. It's the phoney choice that results in dumbing down. This Group intends to raise the bar. It has strong links with the best scientists globally, and we should repay their generous advice with exhibitions worthy of their contribution.

2 Teenagers and other adults are hungry for us to challenge them, too. Families and school children have long been our most loyal audience. Our audiences are our oxygen, but we should expand our lungs, and escape the comfort zone of specialising in one age range. We cannot help to forge a society more in tune with science unless we embrace the engaged adult too. Our museums will become forums for debate where leading players in politics, business and education come to discuss the future.

'We cannot help to forge a society more in tune with science unless we embrace the engaged adult'

3 The world's other great science museums are thrilled to see the UK's Science Museum Group behaving like a confident international body again. They have been puzzled by our reticence in recent years. Such collaborations are about public benefit, not our vanity. Science is a global enterprise and our programmes will thrive if they are plugged into the global community. Over the past year we have been renewing partnerships in Europe, North America and Japan and building new alliances in India, South Africa, Brazil, Russia and Qatar.

4 A major milestone this year has given the Group impressive national reach. The Museum of Science & Industry in Manchester (MOSI) joined this alliance of key museums in London, York, Bradford and Shildon. MOSI brings with it landmark industrial heritage, and has expanded the Group's audience beyond 5 million visits a year. Ours is now the most significant grouping of science museums in the world and will be an indispensable voice in national debates about innovation, education and culture.

5 We need to celebrate our collections, because they are the keystone of a museum's credibility. Ambivalence about them in recent years was wrong. The Group cares for more than 7 million artefacts which form one of the most iconic collections for science, technology, medicine, media and engineering in the world. To capitalise on this rich resource we intend to recapture our reputation for scholarship and research, and a key priority for the coming year is to trumpet our astonishing collection of photography. All of our museums' collections are treasure troves of personalities, and surprising ideas that might yet shape the future.

6 Ultimately, the Science Museum Group rejects the idea of science and culture leading parallel lives. Our kaleidoscopic collections show so vividly that science has always been part of culture. The collections are an epic story about civilisation and human ingenuity, as vital as anything on the walls of the British Museum or the National Gallery. And it is hardly surprising that planned partnerships with music, drama, dance, literature and film are very popular with scientists.

Given the choppy economic climate, I ought to be pessimistic about our agenda for expansion. New ambitions need resources to make them a reality. Yet the strong radio signals received from those with the money and connections to realise our vision have been encouraging. They like our seriousness – and our touch of ruthlessness. Those who care about science urge us to move up a gear, and realise our extraordinary potential.

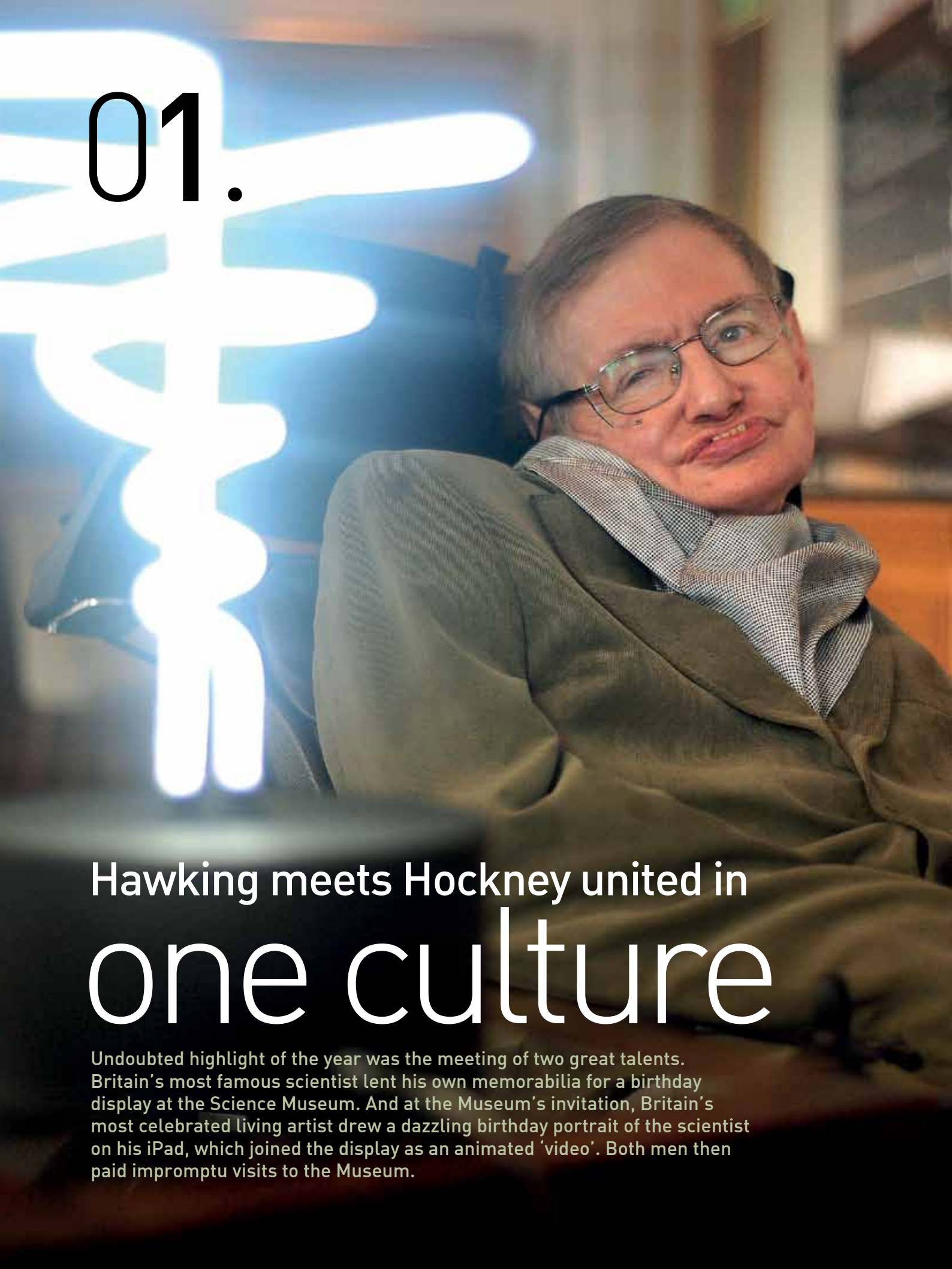
‘Our museums will become forums for debate where leading players come to discuss the future’

A DOZEN WAYS WE **WON THE NATION OVER** TO SCIENCE AND INNOVATION THIS YEAR

There is a growing public demand to understand the modern world and the Science Museum Group is dedicated to helping people make sense of science and innovation. We are no less dedicated to nurturing the best scholarship and learning.

In a busy year we achieved record attendances and announced our new alliance of five museums as a powerful cultural force. Our peerless collections boast more scientific 'firsts' than anywhere else. Our insights into learning are widely sought.

The Annual Review has selected these 12 highlights from the past year to express the scope of our achievements on the pages that follow.



01.

Hawking meets Hockney united in one culture

Undoubted highlight of the year was the meeting of two great talents. Britain's most famous scientist lent his own memorabilia for a birthday display at the Science Museum. And at the Museum's invitation, Britain's most celebrated living artist drew a dazzling birthday portrait of the scientist on his iPad, which joined the display as an animated 'video'. Both men then paid impromptu visits to the Museum.

Black Hole Light – a birthday gift presented to Professor Hawking at the Science Museum from its Inventor in Residence, Mark Champkins. Right, David Hockney draws Hawking this year in his Cambridge office. It was the artist's first portrait on an iPad to be displayed in a museum, and now forms the cover of this magazine, while the portrait becomes a Museum acquisition

'There are great challenges facing the human race and I hope that young people of today will use science and technology to solve them' – Professor Stephen Hawking

Stephen Hawking: A 70th birthday celebration was the first exhibition drawn from the cosmologist's personal archive. It encouraged visitors to reflect on the relationship between his achievements, particularly those that established his reputation in the 1960s and 1970s, and his immense success in popularising astrophysics. Hawking and his daughter Lucy helped select special objects that included handwritten notes on work with Roger Penrose, his drawing of the Hawking radiation mechanism, an annotated script for his guest appearance in *The Simpsons*, and the blue suit he wore for a zero-gravity flight.

To accompany the display, Professor Hawking also recorded a message in which he declared: 'The Science Museum is one of my favourite places. It does such a great job of introducing young people to the wonder and excitement of scientific discovery.'

Illness forced him to miss the VIP opening of the new exhibit. Then one Saturday afternoon a huge buzz filled the Museum when Hawking arrived from Cambridge University to take a look.

His famous wheelchair caused many double takes from visitors who instantly turned him into a Pied Piper. (He was diagnosed with motor neurone disease at age 21 and today uses a wheelchair.) Alison Boyle, Curator of Astronomy, played tour guide while a happy crowd of 200 followed them throughout the building from the Apollo 10 capsule to the hands-on *Launchpad* gallery after he had typed the word 'children' into his voice synthesiser. When everyone sang an affectionate chorus of 'Happy Birthday', the Prof beamed in appreciation and typed 'thanks'.

He was also well enough to sit for David Hockney's digital portrait, the artist's latest experiment in technology, this time created on an iPad with a fast, versatile app called 'Brushes' which he helped develop. What went on display was a mesmerising three-minute time-lapse animation in which we watch the artist change his mind and redraw his coloured lines. It was mounted alongside Hockney's 1978 ink drawing of Hawking, made years before the Prof's book *A Brief History of Time* thrust celebrity upon him. The new portrait is arrestingly intimate and accentuates the scientist's luminous violet eyes.

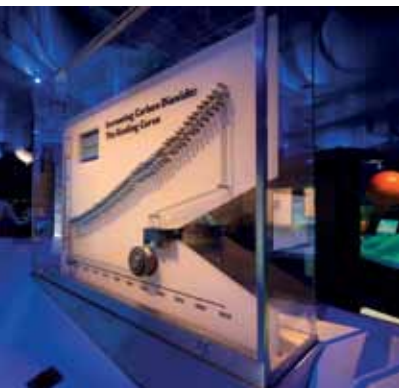
The *Guardian*'s art critic Jonathan Jones wrote: 'Hockney's portraits of Hawking are important documents of what really mattered in the culture of our time. Like Epstein's Einstein [*on show at the Science Museum*], they will still be looked at when much art that makes headlines is utterly forgotten.'

02.

Understanding
visitors is where we excel

A science museum hopes that its visitors leave with a deeper understanding of whichever issues have caught their attention, yet it has more barriers to overcome than many other kinds of gallery. One is the embarrassing moment when an adult visitor cannot answer an elementary question from his or her child. The Science Museum Group is adept at heading off such moments thanks to the expertise we have amassed over 15 years.

Continual audience research is rare in UK museums. Dr Alex Burch, Director of Learning, says: 'We are at the forefront of audience research because the team is permanent and able to integrate knowledge of the audience into the process of making exhibitions, events and websites. Our accumulated knowledge guides our approach to bringing collections alive. Right from conception of a new project, the research team pursues a cycle of testing – from focus groups to assess content approaches, through usability testing of interactives to quantitative and qualitative surveys once an exhibition has opened.'



The award-winning *Atmosphere* gallery dedicated to climate science has attracted 737,000 visits during its first 12 months, yet research beforehand had shown that most people thought the subject difficult and dull and had a hazy understanding of the carbon cycle, how greenhouse gases work and of geo-engineering.

Dr Burch says: 'Where our designers and curators really excel is laying out the tools to overcome those barriers. We found people wanted access to real evidence for climate change and that encouraged us, for instance, to put the Keeling graph on display which shows atmospheric carbon dioxide increasing since 1958, and we animated the curve next to the flask that Charles Keeling used for collecting his samples.'

Atmosphere created a new model for displays because it was driven by a controversial and complicated issue in which interactives act as entry points catering for a variety of learning styles and knowledge levels, while in-depth content stations enable visitors to dig deeper in a self-directed way. The exhibition is frequently updated to encourage further visits.

Dr Burch enjoyed the verdict of one adult visitor who said: 'This is a good dinner party topic. Before, I wouldn't have been able to contribute to the discussion but now I feel able to give my opinion.'

An important application of evidence-based exit surveys is to provide feedback to our funders, and demonstrate the impact of their generosity. The Group itself also wants convincing that lessons learnt will have an impact beyond the lifetime of the gallery. Plain enjoyment is not all that our visitors look for – they could go to any theme park for that. And a diet of solid information can prove unappetising if the delivery is dull. We know that a life-enhancing visit combines enjoyment with learning and going home with a different perspective.

'I greatly enjoyed my visit to the Science Museum's exhibit on climate change and look forward to more powerful educational experiences from the Museum'

– Al Gore, Former Vice President of the United States and Chairman of the Climate Reality Project

Above: Every foot of the way through the *Atmosphere* gallery has been researched, from signage to self-directed content stations

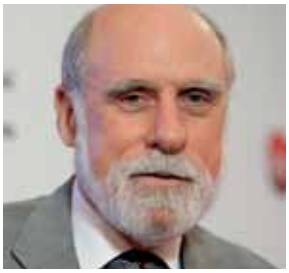
Far left: The Keeling graph showing atmospheric carbon dioxide is animated to help place its progress in the context of contemporary events

'What the Science Museum doesn't sell hard enough is its astonishingly high-quality audience research. We are world leaders at understanding what people take from the content of a gallery. It's one of our USPs'

– Dr Roger Highfield, Director of External Affairs

03.

Virgin Media backs our global first on internet impact



'The civilised world has become very dependent on access to information and to lose that would be traumatic'

— Vint Cerf, one of the 'fathers of the internet'

Astonishingly, the Group's major gallery opening of the year, *Life Online*, proved to be a global first, even though 2.3 billion people today use the internet – a third of the planet's population.

Tom Woolley, the National Media Museum's lead curator of *Life Online*, explains: 'Although other galleries tell the story of the internet, no other permanent space in the world is dedicated to exploring how the internet's ever-evolving history links to its social, technological and cultural impact on our lives.'

Left and below: The new *Life Online* gallery, which was opened with the video presences of Vint Cerf (above) and Sir Richard Branson (lower image)

The new ground-floor gallery draws the visitor's eye the moment you enter Bradford's landmark building, and is designed to engage you immediately in hands-on activity. Several universities and a host of experts, including Ray Tomlinson, the man who sent the first e-mail, have advised on telling the story of the net's origins, from the experimental Arpanet computer network in 1969, to the invention of the World Wide Web in 1989 and beyond.

Funding came from the regional development agency Yorkshire Forward, with more from the DCMS Wolfson fund. Virgin Media was among a number of corporate supporters and *Life Online* was opened in March by the virtual video presences of Sir Richard Branson and the American computer scientist Vint Cerf.

On overhead screens, Virgin founder Branson affirmed his faith in the medium: 'The internet is all in all a force for good. From Syria to Israel, Egypt to the US, the power of the internet – to give a voice to those who previously had none – has been proved. The future of the internet is truly tied to the future of the planet.'

Life Online confirms a potent new partnership between the National Media Museum and Virgin Media. This was the first of three ambitious sponsored museum projects with the Science Museum Group. The most significant is *Media Space*, which from next year will showcase the Museum's many world-class collections within a flexible gallery at the Science Museum in London to promote debate about creative technologies. Virgin Media's support is both financial and expressed through awareness-raising activity.

At the Media Museum a new in-kind corporate partnership saw the designer Start JudgeGill contributing to another *Life Online* gallery on the top floor. This programmable space aims to explore contemporary issues such as online identity, citizen journalism and, currently, threats to the culture of open-source collaboration. The first show involved an art collective of young people from West Yorkshire called Networked.

On the Museum's blog, the Your Life Online project invites the public to share their experiences alongside Richard Branson's and Vint Cerf's. Cerf wrote: 'Things we can't remember we can find with Google. The network remembers for you.'

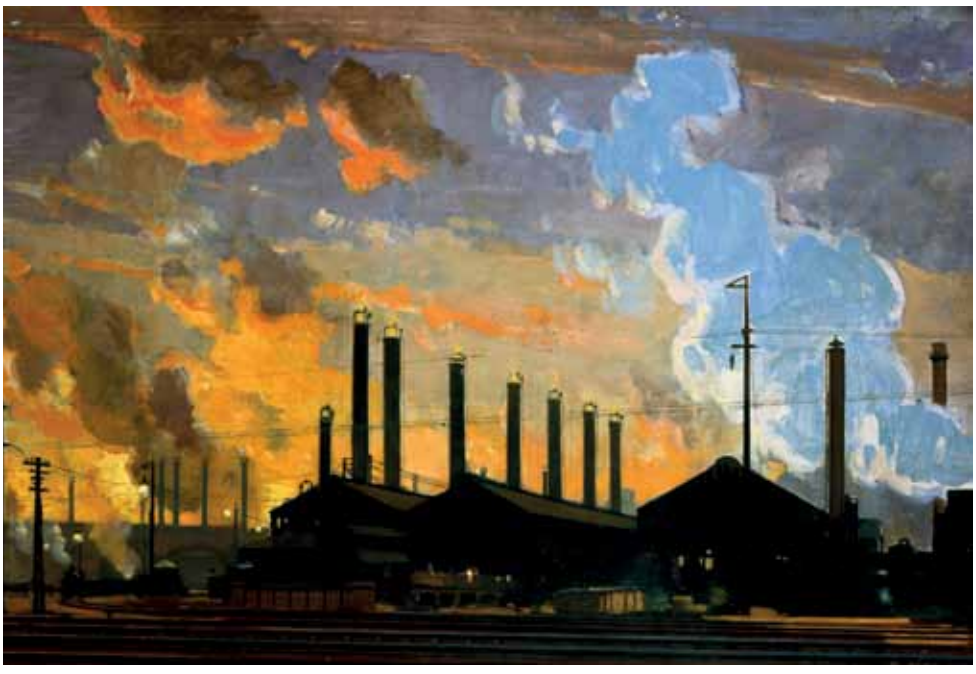
04.

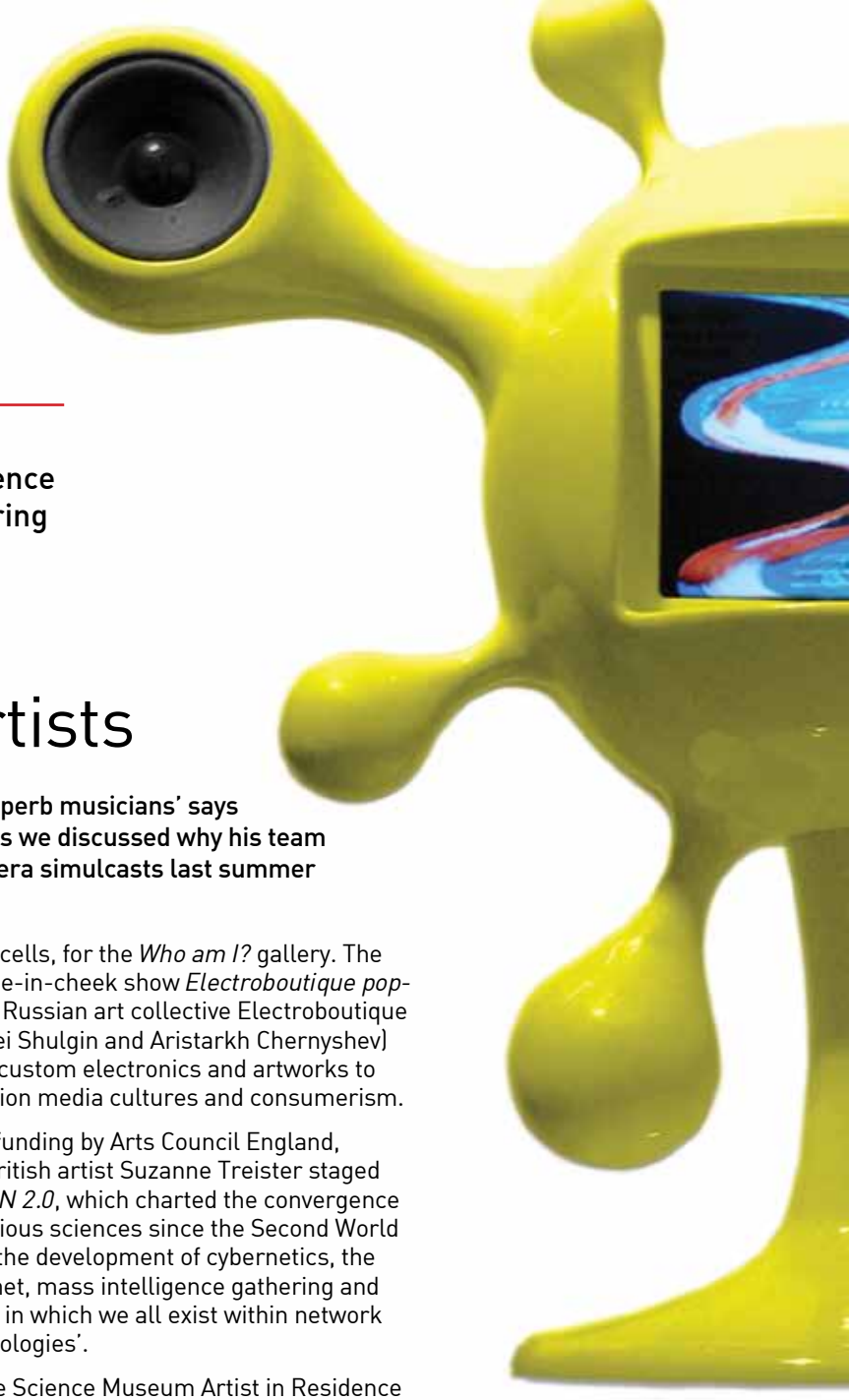
Adventures

break down

Previous page: *The Way I See It!* by Electroboutique, as are *Teleblaster* (centre right) and *3G International*, the spiral light sculpture (facing page)

Above: Conrad Shawcross's *Hyperbolic Swarf Drawings* and, right, *British Industries, Steel*, an oil painting from 1924 by the Canadian/British artist Richard Jack RA, from the NRM collection





'You don't have to be brave to cross our threshold. What people want from a science museum is to know, for example, not string theory itself, but why it is important'
– Heather Mayfield, Deputy Director, Science Museum

Adventures with artists

'Great scientists and mathematicians are often superb musicians' says Jonathan Newby, SMG's Chief Operating Officer, as we discussed why his team had invited Glyndebourne to present three live opera simulcasts last summer on the Science Museum's IMAX screen.

Die Meistersinger was a triumphant production, and during the first interval dinner was served for VIP guests, and champagne and picnic hampers for ticket-holders, as if they were thronging the lawn at the East Sussex opera house. Our leading patron, Martin Smith, after whom the Smith Centre is named, and Guy Christie, of the Glyndebourne family, made speeches, and by turning it into a smart event the Development team had attracted a crossover audience to South Kensington.

Newby's rationale: 'There's no reason why the Museum shouldn't be recognised as a music venue.'

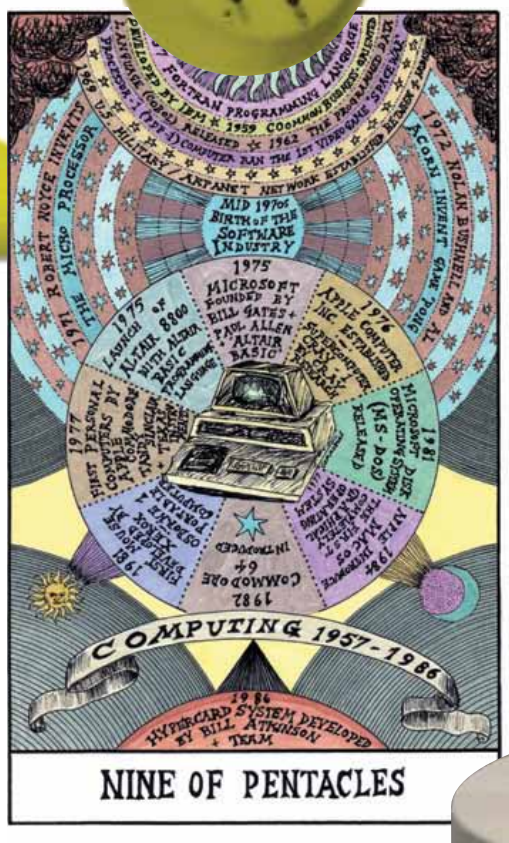
The Group is determined to send out the signal that science is part of culture and is actively bridging the historic gap that has yawned between the 'two cultures' since British empiricism and European Enlightenment parted company in the 19th century.

A provocative approach to visual art has been pursued for the past 13 years by Hannah Redler as Head of Arts Programme, who says: 'The whole Science Museum is shamelessly theatrical. We bring in stunning art works to help open people up to seeing things differently.' She asks artists to challenge science and technology and secured the loan of Gina Czarnecki's *Palaces*, made with donated milk-teeth and raising questions about the mining of stem cells, for the *Who am I?* gallery. The tongue-in-cheek show *Electroboutique pop-up* by Russian art collective Electroboutique (Alexei Shulgin and Aristarkh Chernyshev) used custom electronics and artworks to question media cultures and consumerism.

With funding by Arts Council England, the British artist Suzanne Treister staged *HEXEN 2.0*, which charted the convergence of various sciences since the Second World War, the development of cybernetics, the internet, mass intelligence gathering and 'ways in which we all exist within network technologies'.

As the Science Museum Artist in Residence Conrad Shawcross showed *Protomodel* in the *Mathematics* gallery, a playful series of sculptures exploring mathematical model-making. In York, the National Railway Museum opened an art gallery dedicated to showing off its huge collection with *Fear and Fascination: Art from the dawn of the railways* (read more on page 46).

On an audiovisual front, *Beyond the Stars* was an 'as live' performance staged by Craig Leon, the composer and former Blondie producer, in partnership with the Science Museum and NASA for broadcast on PBS and a DVD. Doug Millard, in his role as space curator, was on hand to ensure the script's veracity.


COMPUTING 1957-1986
NINE OF PENTACLES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Photos
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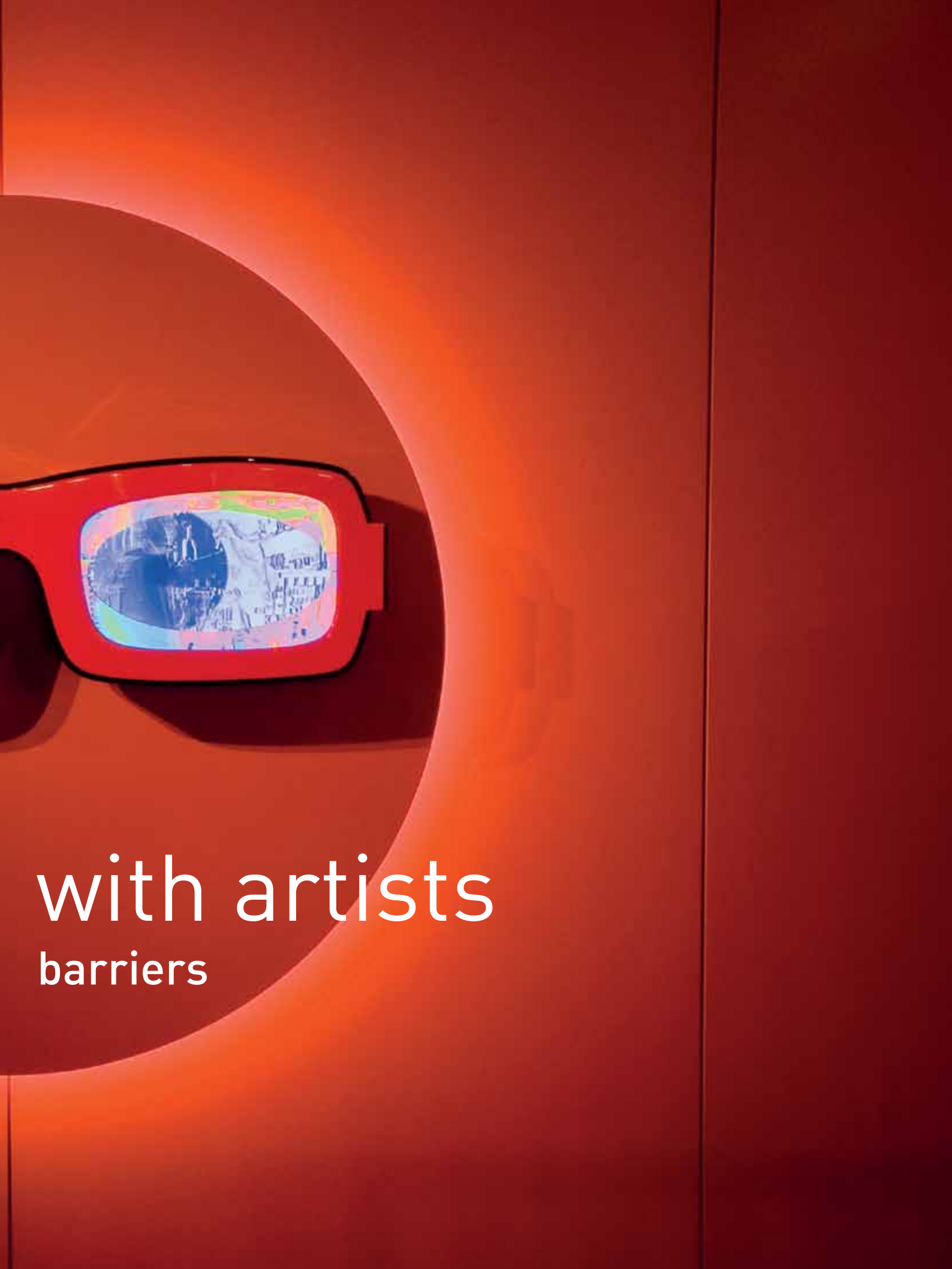
Camera
iPod

Clockwise from the sepia photograph: The *Cottingley Fairies* (1917) by Elsie Wright and Frances Griffiths on show at the National Media Museum; Glyndebourne's simulcast of *Die Meistersinger* in the Science Museum IMAX; recording of *Beyond the Stars* by Craig Leon; Gina Czarnecki's *Palaces*; and *Nine of Pentacles* by contemporary British artist Suzanne Treister



with artists

barriers

05.

A right regal new railway terminus for York

The proud locomotive *Gladstone* heads the new royal procession of coaches in Station Hall at the National Railway Museum, York

Left to right: Vintage carriages, Queen Victoria's 'palace on wheels', and the locomotive *Maude* artfully lit by Liverpool Institute for Performing Arts in an annual competition

At the National Railway Museum a dream is being realised – to reinvent a bustling mainline railway terminus from the age of steam where the star attractions are more royal trains than a monarch could shake a sceptre at. Queen Adelaide's plush saloon of 1842 is possibly the oldest royal carriage in the world. Her forward-facing bed required an extension through the wall to accommodate her feet.

Among the NRM's sprawling complex, Station Hall is a substantial shed which was once a busy goods depot, built to cover four incoming lines. Last year it closed for a romantic rethink inspired by 19th-century photographs. A major shunt removed, juggled and refreshed the complete line-up of vehicles along its platforms.

The hall will eventually emerge as a sparkling treat, thanks to a significant DCMS Wolfson grant. You can almost hear puffing steam as you take in the green wrought-iron gates, ticket machines, a highly atmospheric restaurant on the central platform, and explore trains that represent many different kinds of journey. British social and industrial history reverberates through splendid vintage carriages, sleepers, dining cars, a Royal Mail sorting office and a carnival of goods wagons.

Spectacular locomotives such as *Gladstone* of 1882 pull contrasting sets of ravishing royal carriages built by private railway companies to win patronage. Queen Victoria decided every inch of the decor for her 'palace on wheels' which cost £1800, while King Edward VII reputedly asked his to follow the same style as the royal yacht. Queen Elizabeth the Queen Mother's saloon was built during the Second World War and was originally fitted with armour-plating to provide protection from bombs. Phase 2 of the refurbishment is adding further layers of storytelling to Station Hall this year and visitors are invited to contribute their own reminiscences of rail travel.

Station Hall has received another kind of makeover as part of the tourism festival Illuminating York. Last autumn the NRM invited teams of theatre-design students each to light a selection of our vehicles for *Locos in a Different Light*. Paying heed to energy consumption and conservation, they transformed Station Hall into an expressionist Valhalla and the judges chose the Liverpool Institute for Performing Arts as the winners. They lit the Scottish-built 1891 locomotive *Maude* and her goods train, which is on loan from the Scottish Railway Preservation Society. The huge audience of visitors voted for Rose Bruford College, who lit *Gladstone* and Queen Victoria's saloon.

06.

Scientific collaboration reveals world firsts in photography

Forging strong research partnerships is high among the Group's priorities. 'The sheer scale and quality of the National Media Museum collection is almost shocking, and I believe that its real importance has been undersold.' This verdict from Ian Blatchford, comes close to that of Dr Dusan Stulik, a senior scientist from the Getty Conservation Institute (GCI). He has collaborated with the Museum on a research project lasting six years and declares the archive 'the best collection of photographs in the world'.

Getty conservationist Dr Dusan Stulik and Philippa Wright of the National Media Museum hold *Un Clair de Lune* by Joseph-Nicéphore Niépce, newly dated to about 1827. Above, the Getty spectrometer scans Niépce's portrait of *Le Cardinal d'Amboise*, etched onto a pewter plate

Me in 3D (above) was a Live Science collaboration between the Science Museum and Great Ormond Street Hospital to amass a database for the NHS

The Getty project, led by Philippa Wright, Curator of Photographs in Bradford, has made a profound discovery. Spectrometric analysis of materials has confirmed the date of the dawn of photography, which had long been placed at 1839 and credited to Daguerre, to be much earlier and be attributed to Joseph-Nicéphore Niépce.

Every year Stulik brings his Portable Analytical Laboratory from California and applies it to the National Photography Collection at the National Media Museum, which embraces the Royal Photographic Society Collection acquired by the Museum in 2002. The team, which also includes Art Kaplan of the GCI and independent conservator Susie Clark, have confirmed that one of three pewter plates, *Un Clair de Lune*, *c*. 1827, made by the French pioneer Niépce, is the earliest and only extant known example of a photographic process which uses the resin of lavender.

The team then discovered that the plate of *Christ Carrying his Cross*, *c*. 1827, was also made by a unique and previously unknown process. They confirmed too that *Le Cardinal d'Amboise* was captured on a pewter plate using the heliographic process invented by Niépce and then etched in an acid bath. An ink print showing the cardinal, but taken from a related Niépce plate, is also in the collection.

Research outcomes have included the conference 'Niépce in England' at the National Media Museum, and Philippa Wright delivering a paper to the Royal Society in London last October. She says: 'The fact that these photographic treasures are part of the national collection cared for here in Bradford is amazing.' A bespoke oxygen-free display case for the plates is being constructed, with funding from the Royal Photographic Society.

Scientific research forms an integral part of the Group's programming. The Science Museum works with its neighbour Imperial College and with University College in the form of *Lotto Lab*'s interactive experiments to deepen our understanding of human perception. A Live Science collaboration with Great Ormond Street Hospital compiled an NHS database of 10,000 visitors' faces in 3D to help them improve treatment for future patients needing facial surgery.

'The National Media Museum in Bradford has the best collection of photographs in the world, no doubt in my mind'

– Dr Dusan Stulik, Getty Conservation Institute

07.

Pop-up events

push museum visits to record highs

Pessimists predict that the rise of virtual communities in the digital era heralds death to the physical experience, yet record visitor figures achieved across the Science Museum Group during the past year allay that fear.

They are all the more remarkable, given the absence of any blockbuster exhibitions and the opening of only two permanent spaces: *Life Online* in Bradford and the Art Gallery in York. Instead, we turned a spotlight on what our museums do best – making sense of the culture of science and our industrial heritage in the name of a free day out.

A series of pop-up festivals was targeted at traditionally quiet periods in the calendar and succeeded in boosting footfall, most dramatically during Wizard Week events at the National Railway Museum in York and in Shildon, where visits by guest locomotives swelled family crowds, and with Moshi Monster week in Bradford and *Robotville* in the Science Museum.

This four-day festival proved a truly phenomenal crowd-pleaser. *Robotville* brought to London 23 of the most advanced experimental robots from across Europe, and their creators, under the aegis of the Polish Cultural Institute. Out on parole from the laboratory, the robots demonstrated cutting-edge technology: some talked, some emoted, one called Eccerobot had an anatomy modelled on human bones, joints and muscles and offered a friendly handshake in an impressive anthropomimetic fashion.

Nevertheless, the event challenged the popular assumption that robots are Transformers in disguise and that Terminator is just around the corner. Heather Mayfield, Deputy Director of the Science Museum, says: 'In *Robotville* it was all too evident that robots are not as sophisticated as people believe, that executing even the simplest task, such as gripping an egg without breaking it, is a massive engineering achievement. Their very interactions with visitors provided an unexpected insight into the scientific method, which often seems to be pretty dull.'

Opposite: Wizard Week in York and Shildon; Dr John C Taylor and his Midsummer Chronophage clock in London

Clockwise, this page: Knitted chromosomes at Stitched Science; Eccerobot, one of the stars of *Robotville*; OP3 Forward Operating Base, Masum Ghar, Afghanistan, 2010 © Donovan Wylie/Magnum

Other pop-ups that attracted enthusiastic audiences, along with high-profile coverage, were the Spend Your Summer in Space campaign; the *Player* festival included an ambitious genre game about aliens taking over Earth, played out live overnight by visitors; and Stitched Science in which knitters created a giant stitched Solar System. National Railway Museum enjoyed the Japan Festival and Royals Weekend, while Bradford pursued *The Lives of Great Photographers*, a temporary exhibition designed for adult audiences.

Fascinating new object-based displays at the Science Museum included the 'time-eating' Midsummer Chronophage clock invented by Dr John C Taylor, and a piece of Moon rock which resulted from efforts over two years by space curator Doug Millard's team to arrange the loan from NASA, who then escorted both the rock and Doug to Houston airport.

08.

'The alchemy exhibition is hugely significant. It is the first to focus on Library and Archive material for 60 years. Those collections far outnumber the objects'
– Rupert Williams, Head of Library and Archives, Science Museum

Scholarship as key to discovery

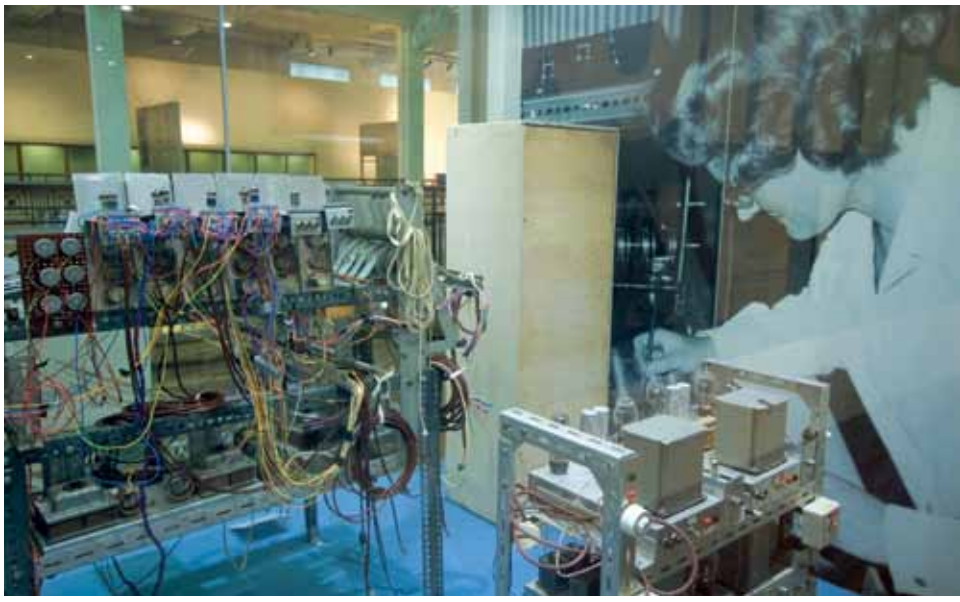
Renewed emphasis on scholarship yielded an intriguing adult exhibition about alchemy called *Signs, Symbols, Secrets* which opened this spring, the first in 60 years to be drawn directly from the Science Museum's own Library and Archives collections. An unexpected bonus was the discovery on a rack of a richly hand-painted scroll, the 23rd in a known series named after the 15th-century English alchemist George Ripley.

Stephanie Millard, Exhibition Project Leader, says: 'The Ripley scrolls are extremely rare and hold vital clues to the development of alchemy. Ours is the first scroll to go on long-term display.'

Loaned by the Wellcome Trust in 1976 to the Museum archive, the 20-foot-long scroll was discovered by Cate Watson, Library Assistant, when she found an 'alchemical' scroll in the Museum's catalogues. Cate says: 'It posed such a puzzle, though the symbolic images that contained clues for the creation of the philosophers' stone looked familiar. Then I suspected it was a Ripley scroll and the expert Dr Jennifer Rampling confirmed it.'

Head of Collections, Hadrian Ellory-van Dekker, endorses the scroll's importance: 'If it proves to be 18th-century, it's a treasure. Even if not, it still encourages a discussion about alchemy which makes for a crossover between arts and humanities and sciences which over time have become separated. Today our institution is underlining the message that they are all part of a bigger whole.'

Ellory-van Dekker is even more excited by the 'tremendously important' digitisation this year of the Museum's extensive Charles Babbage archive – 19th-century technical drawings of would-be mechanical computers, more accurate than an average modern pocket calculator. 'By digitisation you can publish to more people and by being able to zoom in, you realise the sheer astounding complexity of the work that Babbage was doing on paper. The beauty of execution puts him up there with Leonardo drawing flying machines.'



Main images, left: Cate Watson with the Ripley Scroll currently on show at the Science Museum

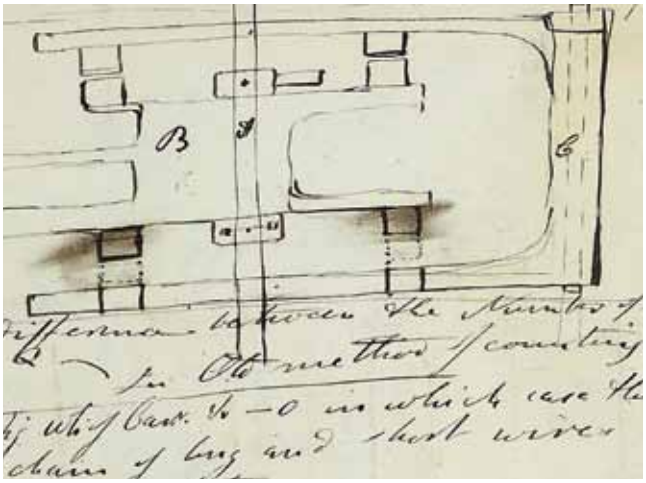
Above: Musician Brian Eno and Daphne Oram's pioneering machine for synthesising music

Below: Detail from one of Babbage's digitised 'Scribbling Books'

An indicative appointment last year was that of Tim Boon as Head of Research and Public History, whose purpose is 'to get more researchers into the Science Museum for the sake of its intellectual life'. He adds: 'I'm here to build research based on our peerless collections, notably in medicine and electronics, most of them held in reserve and virtually unexploited.'

The first outcome of the Public History project saw musician Brian Eno opening *Oramics to Electronica*, a fascinating interactive display around a clunky box of circuits and celluloid built by Daphne Oram, who pioneered synthesised music in the UK and co-founded the BBC Radiophonic Workshop. The exhibition celebrates the 'make do and mend' mentality of musicians and drew input from Goldsmiths and Anglia Ruskin universities.

We also appointed our first Museum Fellow of Modern Science, Harry Cliff, who divides his time between the University of Cambridge team working on the LHCb experiment at CERN and the Museum, where a new exhibition on the Large Hadron Collider is under development.



'It's brilliant to see these museums attracting record breaking numbers. It's clear the UK's appetite for science is burgeoning'

– Ed Vaizey, UK Minister for Culture

Discovered

by Library Assistant Cate Watson,
a rare 18th-century alchemist's scroll

09.

Resilience rules
while we try to raise money

Against a backdrop of economic uncertainty, museums must pursue funds with vigour to meet the pressing demand from an enthusiastic public. What vexes Director Ian Blatchford is that the recent debate about tax breaks for donors addressed the wrong issue: 'The real bind is the number of individuals who don't give anything at all!'

Reduced Grant in Aid funding from the Government has required the Group to achieve serious cost savings and generate fresh income streams. We have continued to implement our staff reduction programme, and this year consolidated storage capability across the Group by improving hangars at the Wroughton site in order to house collections from the National Railway Museum and National Media Museum. We stabilised the environmental conditions required for conservation at both those museums, while in his new role as Head of Sustainable Development, Matt Moore trialled a unique solution at Wroughton by constructing a storehouse out of energy-efficient hemp. The Group has also continued to reduce energy consumption and in London is committed to the Carbon Reduction Masterplan for the 1851 Estate.

Innovative sources of income arose from the popular Science Museum *Live on Tour!* theatre tour; an enhanced on-site welcome which has increased visitor giving significantly; and the surprise success of the Red Arrows flight simulator. We owe thanks to Virgin Media for sponsoring three Group projects; to MasterCard for supporting Lates; and to Johnson Matthey for extended Science Nights. Commercial initiative landed a technology first for the Science Museum: an augmented reality iPhone app in which @MrJamesMay becomes your tour guide.

Raising our profile is the all-important challenge for the Development team, so it is a source of great satisfaction that the Science Museum was awarded £6 million from the Heritage Lottery Fund towards our flagship *Making Modern Communications* gallery. Director Ian Blatchford says: 'This project represents a step change, both in terms of gallery development and as a first step in the delivery of the masterplan.' Other generous donations of £500,000 from the Garfield Weston Foundation and an initial £1 million from Google signal the beginnings of a stream of funds needed to complete this important contemporary gallery.

Nevertheless, Blatchford reflects on a distinctly British phenomenon: 'Even though we think we've lived through ten good years of corporate philanthropy, the number of individual donors is depressingly tiny in the UK. One is acutely aware of this in London where so many people have considerable personal wealth. I say to potential donors: The most urgent priority is to restore the status of science and industry. You really ought to be part of our regeneration. I want to get to the point where people will feel anxious if they're *not* part of the SMG's regeneration. There are plenty of rewards for them in a partnership with us.'

'Unlike America where people compete with each other in their philanthropy, in Britain we have a long way to go'

– Ian Blatchford

Clockwise from the Red Arrows simulator (top): At various fundraising events, Trustee Howard Covington with Antony Hewish, Nobel Prize winner; VIPs at the Stephen Hawking celebration; artist's impression of the *Making Modern Communications* gallery; and Group Director Ian Blatchford at a Christie's charity auction with Trustee Michael Wilson and his wife Jane

10.

Championing a return to apprenticeship

The Science Museum Group is not alone in offering apprenticeships where young recruits learn their craft skills on the job, but we have now extended them to embrace the educational skills required by a museum's learning department. The tradition of apprenticeships stretches back to the guilds of the Middle Ages, but fell from favour in the 1970s when a declining perception of vocational training across industry led to the end of public funding. In 2009 a new organisation, the National Apprenticeship Service, was announced to promote training schemes.

At the National Railway Museum in Shildon, Steven Foxton and Jason Brown tackle a major conservation task as part of their training

'The Science Museum Group is devising a national strategy for engaging with a range of science and technology museums and science centres'

– Dr Roger Highfield, Director of External Affairs

Over the past year the Science Museum Group has appointed 10 apprentices. The National Railway Museum's workshop team at Shildon has Jason Brown, 19, and Steven Foxton, 31, each at different stages of training in general engineering, conservation and railway operations. Both hope that the outcome will mean a career in railways.

Jason's scheme runs four years, five days a week, while studying for an HNC mechanical engineering qualification through Teesside University. He has qualified as a guard and steam locomotive fireman for the Railway Museum and he's loving it. 'There's been a few wow moments!' he says. 'I even got to drive *Tornado*, the new A1 steam engine which was built locally. It was brilliant, just to feel the amount of power.'

Steven, from Spennymoor, has previous experience as a coach-builder, and is on an Engineering Heritage Skills Initiative placement which will broaden his knowledge to include restoration techniques. By keeping lost heritage skills alive, this training itself becomes a form of preservation. He says: 'The Railway Museum is giving me a fantastic opportunity.'

In addition, Darlington College and Trackwork Training form a unique partnership with Shildon, which provides the training facilities, and saw 100 students receive NVQ certificates in railway maintenance last November.

The Museum of Science & Industry in Manchester employs a 17-year-old apprentice in its Learning department acquiring administrative skills. In London Science Museum Learning has recruited four apprentices, all from disadvantaged backgrounds and aged 16–19, to work within its team alongside our Explainers, the skilled communicators who spread enlightenment among visitors to our interactive galleries. The lucky four were chosen from 120 applicants and after a year hope to have qualified in Cultural Venue Operations Level 2 awarded by Education Development International.

Also at the Science Museum, Head of Workshops Steve Long – himself a former engineering apprentice – supervises the basement areas where his 23-strong team build and maintain all the exhibition displays. Last year he recruited full-time apprentices in woodworking, which is 'a massive part of what we do' because of the increase in small-scale shows. He is especially pleased with the mounts for the current *Oramics* and alchemy displays – 'The best of any we've made,' he says.

11.

Steam pioneer James Watt's workshop casts an unexpected spell

'Redisplaying James Watt's workshop was animated by our sense that the shop space itself has the power to induce a sense of wonder,' says Andrew Nahum, Senior Keeper at the Science Museum. 'And it does. But the accompanying permanent exhibition is also about society changing from a world without mechanical power to one running on steam and which could produce new goods in profusion.'

Another challenge for the team was to reintroduce James Watt to new visitors in an age in which steam power is not as visible as it once was, and when many haven't heard of him or are vague about what he did. Nahum says: 'Research told us that quite a few people thought he invented the light bulb. Moreover, we wanted to make the display richer than a straightforward history of a steam pioneer and talk about the roots of industrialisation.'

Watt's workshop is a historical time capsule which was presented to the Science Museum when his Staffordshire house was demolished in 1924. Since his death in 1819, the attic workshop had been locked and left undisturbed, but had become a kind of shrine to historians of the Industrial Revolution. Its caretakers even asked the Museum, 'Do you want the dust?' The complete room, including door, window, skylight, floorboards and 6500 objects, many methodically wrapped and labelled by Watt, were brought here and carefully reassembled. Last year's opening of *James Watt and Our World* saw the workshop appropriately resited in the Energy Hall among his early engines – mechanical giants of the early Steam Age. For the first time visitors are given close access to his tools, chemicals, inventions such as his letter and sculpture copying machines, but most notably to the absorbing and emotive ambience of the room itself.

This 'magical retreat' is a potent physical record of the working life of the ingenious Scottish engineer who became so famous the Victorians saw him as the father of the Industrial Revolution and memorialised him in Westminster Abbey as a national hero. Even today his face appears on the latest issue of the £50 note, alongside his dynamic business partner Matthew Boulton. The show's opening in spring 2011 generated exceptional media coverage and the year since has yielded a prodigious number of papers and lectures.

'Watt hits so many bases: the science of the 18th century, the emerging new industries, geology, sculpture, and the reproduction of art,' Nahum says. 'Today, of course, nobody believes one man could have started the Industrial Revolution but this is how he was seen by the Victorians. Nevertheless, steam altered whole economies and revolutionised British manufacturing.'

Maps nearby chart the emergence of new industrial areas and the boom in cotton-spinning across Lancashire as steam engines freed mills and factories from former reliance on water power and river locations. A showcase filled with the products of the Industrial Revolution forms a dramatic illustration of how homewares became newly affordable through machine production.

Nahum sees Watt as an early 'scientific entrepreneur' who had a fruitful relationship with his mentor, the chemist Joseph Black. 'For interested readers the issue of the flow of knowledge both ways between science and technical practice is an ongoing study and something I hope they will take from the exhibition.'

Transported to the Science Museum: Watt's workshop which was sealed on his death in 1819. Below, a model factory as a tool for planning its design. Opposite, mezzotint of Watt by James Scott

12.

A record-breaking year
for learning and sharing expertise

We neither teach nor lecture our audiences about science in the Science Museum Group. People visit us precisely because we are not a classroom. They do want to learn, not in an academic context, but in surprising and imaginative ways. The under-16s form a core audience at our museums, and comprised one-third of our 5.2 million visitors last year.

Above: Feel the Force is a demonstration show exploring motion; below, Katsuma stars in the Moshi Monster week at National Media Museum; an outreach festival and a teachers' evening

Learning, outreach and communication of scientific ideas consume the biggest single tranche of our expenditure. As an institution concerned with the culture of science, our role is to represent the history of scientific innovation as the core and record of that culture, for the benefit of our visitors, current researchers and the teaching profession.

Director Ian Blatchford says: 'A worry for me about education is that we tend to persuade children to study science in order to become professional scientists. At SMG our ambitions are bolder: we want more people of all ages to engage with science and technology not only because they are forces for good, but scientific literacy and deeper understanding will increase the effectiveness of workforces all across industry and government.'

'Now more than ever we need to foster new generations that understand, appreciate and practise the scientific method'

– Stephen Fry, actor and writer

Even a fun festival for children aged 6–12 is informed by these cultural and social priorities. By far the year's biggest success at Bradford's National Media Museum was its Moshi Monster week, themed around gameplay and educational puzzles from the world of the adoptable pet monsters. In just nine days over February half term almost 38,000 people enjoyed activities aimed entirely at helping children stay safe online. Two in five of those visitors were new to the Museum.

This year the Group received 600,000 visitors in booked education groups, the Science Museum setting a new record. Much of our learning work is carried out in partnership, the most significant being the seven-year Department for Culture, Media and Sport Strategic Partnership-funded project, Anim8ed, which has its own website. Learning shares its expertise through teacher evenings and training while the Enterprises team creates a vast assortment of virtual and physical learning products for schools.

Off-site 111,000 people enjoyed our Outreach activities while *Science Museum Live on Tour!* expanded its programme of theatre performances, reaching 39,000 people across the UK and Ireland.

Online we have broadened the reach of our learning resources, to include the 1.6 million web users of the *Times Educational Supplement*, while the Talk Science blog for teachers spotlights topical science news relevant to the classroom. An online suite of educational games called *Futurecade* was created with input from teenagers themselves, in which budding digerati can discuss emerging technologies. Since its launch in 2011 it has received over a quarter of a million visits.

OVERVIEWS OF THE YEAR FROM EACH OF OUR MUSEUMS

Science Museum, London
National Railway Museum, York
National Railway Museum, Shildon
National Media Museum, Bradford

And first impressions from the new Director at the Museum of Science & Industry, Manchester

'Grant in Aid just about covers the running costs of the museums. For anything new and different we want to do, we have to raise the funds'

– Sue Fisher, Director of Development, Science Museum Group

The flagship museum as a **magnet for each generation**

This year the Science Museum welcomed 2.95 million visitors, our highest annual total since free entry was introduced in 2001. A record-breaking 20,000 visitors were counted in a single day. We are the most popular destination for free school trips in the UK. Half of our daytime visitors come in family groups. Adults visiting independently make up one-third of our audience. This is the segment we are seeking to grow whilst treasuring our core family audience.

Clockwise: *Launchpad* interactive gallery; *Making the Modern World*; Cockroach tour at the Apollo 10 Moon mission command module; model of the Solar System by John Rowley in 1712 for the Earl of Orrery; Fénix 2 capsule built to rescue miners trapped underground in Chile's Atacama Desert

A body of opinion detects an increased interest in science that some refer to as the 'Brian Cox effect', or even as 'geek chic'. Dr Roger Highfield, Director of External Affairs at the Science Museum Group, says: 'What we are witnessing is not so much a rise of science as recognition of its central role – science is, through technology and engineering, the dominant force on modern culture.'

This year's busy Science Museum programme has certainly been catholic in its cross-cultural appeal: the Chilean miners' rescue pod, alchemy, electronic music, the dress-up Cockroach Tour as a novel approach to climate change, interactive art in *Electroboutique*, and opera 'as live' in the IMAX cinema. (Specific successes are detailed on pages 10, 22, 28.)

Though the Museum is free to access, we are acutely aware of the competition from digital media, so strive to create uniquely life-enhancing physical experiences. Our Senior Keeper Andrew Nahum argues that visitors make split-second decisions while walking through the galleries whether to be detained by a particular display.

'Exhibits are a confection of artefacts, graphics, information, ambience, technology,' he says. 'Curating a display is a creative art something like journalism, but in another dimension and with more tools. In the Museum we offer many different styles of address ranging from the contemporary science in the Wellcome Wing to hands-on engagement in *Launchpad* but a crucial magnet is the cultural value and visual allure of the artefact. Whether we're viewing a traditional canoe or a jet engine, we want to use our scholarship to reveal the social, intellectual, and political milieus from which they derive and to give a glimpse of the ingenuity and creativity that they embody.'

The Science Museum's unmatched collection of 800,000 items is not an anonymous assemblage. Every object encapsulates the brilliance, passions and history of talented individuals who deserve to be understood. Our audience wants us to tease out these stories and to convey the science, the imagination, and the choices which have led to the complex web of machines, technologies and scientific knowledge which frames our lives.

NATIONAL RAILWAY MUSEUM, YORK

Celebrating railways which fuelled the Industrial Revolution

The world's largest railway museum: the Great Hall is at its heart where giants from all eras can be admired; below, a Meccano model from the show Big Fun with Little Trains; a spanking new City Entrance, foyer and shop; far right, the only 1964 *Shinkansen* Bullet Train outside of Japan is in the National Railway Museum

'NRM's big objective is to refresh our relationship with the modern railway industry. We'd lost the power of that connection'

– Steve Davies, Director, National Railway Museum

The National Railway Museum in York cares for the largest collection of railway artefacts in the world, including 300 important locomotives and rolling stock. It has won more White Rose Awards for tourism than any other Yorkshire attraction, grown millions in tourist revenue, and last year boosted its visitor numbers to 732,000. How? Director Steve Davies says: 'Because an exciting programme was well planned to focus on a free family outing without any dumbing down – events such as the Japan Festival, Royals Weekend, Big Fun with Little Trains. Our own science show for the family brought in 55,000 visitors.'

The sheer spectacle of exchange visits by internationally renowned engines in full steam charges the atmosphere with a history that reaches back almost two centuries. Davies plans to provide a locomotive servicing facility in his South Yard to bring in the steam engines which pull specials through York five or six times weekly during the summer.

He adds, however: 'We do not want the Museum to be perceived as a theme park. Everything we do must respect our core mission: to spread the story of how the railways emerged, not into an industrial world that existed, but one they actually created, then evolving into a vital form of transport which today promises a vigorous future. One of our big objectives is to refresh our relationship with the modern railway industry, and we enjoy a close relationship with Network Rail in terms of public debate, sharing expertise and expanding our operations nationwide.'

A busy year saw the Museum enliven Station Hall with a complete rethink, open a new art gallery, redevelop its City Entrance and shop, and host the hugely popular Harry-Potter-inspired Wizard Week. NRM also ran Engineering Week workshops, launched Year of the Volunteer on whom much work depends, continued the restoration of *Flying Scotsman*, and began weekend steam shuttles to improve links with a rising star, the sister museum 60 miles away at Shildon (more on next page).

Birthplace of all the world's railways

More visitor records were broken last year when the National Railway Museum in Shildon attracted 210,000 people and enjoyed its best year since opening in 2004.

Shildon resonates with history. The Museum was built by the National Railway Museum and sited near the engineer Timothy Hackworth's Soho Works on the Stockton and Darlington Railway which opened in 1825 to connect collieries around Shildon with the ports. This was the world's first publicly subscribed passenger railway and today's Tees Valley line follows its route. Shildon Works, which built engines and rolling stock continuously until 1984, are considered 'the cradle of railways'.

Preserved and on show at Shildon is *Sans Pareil*, the steam locomotive built by Hackworth for the landmark Rainhill Trials of 1829 which were famously won by Stephenson's *Rocket* (currently displayed in the Science Museum). Nearby at Shildon is the APT-E tilting Advanced Passenger Train, which still holds the British speed record of 152.3 mph for a non-electric train.

These days Shildon bustles with locomotive arrivals and departures and crowd-pleasing events: the Early Days of Steam gala, the wizard-themed spring bank holiday, Engine Driver Experiences, collectors' days, vintage vehicles rallies, heritage open days and the Cab It! event when visitors can mount the footplates of locomotives. There was even a spooky

Railway Ghost Walk on Halloween, in homage to the exploding boiler disasters of the 1800s.

The once-in-a-lifetime celebration which took full advantage of the artfully designed apron outside the Museum was the Deltic 50 anniversary, which brought to Shildon all six surviving production Deltic locomotives which dominated express passenger services on the east coast main line during the 1960 and 1970s.

Part-funded by Durham County Council, Shildon has workshops equipped for conservation and for training new generations in railway engineering skills. Turn to page 26 for a fuller report on apprenticeship schemes.

On the apron at NRM Shildon last autumn: British Rail Deltic diesel locomotives which dominated the east coast express service until 1978 when InterCity 125s took over

Top: Steam special pulling out of the neighbouring Shildon railway station