2016 PROGRAMME

SCIENCE SUMMER SCHOOL

BRITAIN – THE BEST PLACE TO DO SCIENCE

St Paul's Way

Education · Foundation · Trust

ST PAUL'S WAY TRUST SCIENCE SUMMER SCHOOL 2016 WITH PROFESSOR BRIAN COX OBE

MAKING BRITAIN THE BEST PLACE TO LEARN AND EXPERIENCE SCIENCE

TUESDAY 26 & WEDNESDAY 27 JULY 2016

Welcome

In association with supporters and sponsors we are pleased to welcome you to our fifth St Paul's Way Trust Science Summer School, hosted by our Patron, Professor Brian Cox OBE.

St Paul's Way Trust School, a 'National Teaching School' and a 'Through School', places science at the heart of the curriculum with its unique Faraday learning pathway. The aim is to inspire young people to become the next generation of Britain's scientists. Our new sixth form research laboratories designed by Queen Mary, University of London build on this offer by giving students access to exciting and cutting edge research such as the Authentic Biology DNA research project.

SSS 2016 offers students who are passionate about science the opportunity to interact with some of Britain's leading scientists, engineers and entrepreneurs through a programme of seminars, discussions and hands-on experiments.

This year we present a programme that mixes the best of science, maths and engineering. We are also delighted to welcome many students from the north of England including West Cumbria as we start to take the project 'national'.

We hope that you will greet our guest speakers with your usual enthusiasm and make a positive contribution to the various sessions. This is an exciting opportunity to expand your scientific knowledge and gain an appreciation of the importance that science plays in all aspects of our lives.

With determination and an enquiring mind you can see what it is possible to achieve in the future when following a scientific career path.

TUESDAY 26 JULY at St Paul's Way Trust School

10:30 Registration
11:00 Welcome and Introduction
Phil Akerman, Associate Headteacher
Professor Brian Cox OBE
Lord Andrew Mawson OBE

Session One 11:15–13:00 Presentations & Practical Workshops

11:15 **The Search for Life in the Solar System, and Beyond**
Professor Brian Cox OBE
11:34 **Maths, Murder and Malaria**
Dr Steven Le Comber
11:52 Q&A Session and General Discussion
12:05 Practical Workshops *(see panel on page 5)*

Lunch 13:00-13:45

Session Two 13:45–15:30 Presentations & Practical Workshops

13:45 **Richard III: The Resolution of a 500 Year-Old Mystery**
Dr Turi King
14:04 **Taking Your Breath Away – New Medical Diagnostics**
Professor Paul Monks
14:22 Q&A Session and General Discussion
14:35 Practical Workshops *(see panel on page 5)*

Break 15:30-15:45

Session Three 15:45–17:25 Presentations & Practical Workshops

15:45 **Thames Deckway – Innovating Across Boundaries**
Anna Hill
16:04 **Hurricanes and Climate Change**
Dr Tom Philp
16:22 Q&A Session and General Discussion
16:35 Practical Workshops *(see panel on page 5)*

17:30-17:45
Closing Address
Professor Brian Cox OBE

Evening Reception 19:00–21:00

19:00 Guests arrive
19:45 Welcome and Introduction
20:00 "A Discussion with Professor Brian Cox"
21:00 Close of Evening Reception

"Since 2012, Brian and I have worked with Executive Headteacher Grahame Price and his excellent science team at St Paul's Way Trust School to develop **Science Summer School** as part of a major local integrated regeneration initiative here in St Paul's Way (www.stpaulsway.com). We have come a long way in the past four years as we continue to build on Professor Cox's ambition that Britain is recognised as "the best place in the world to do science".

Science Summer School 2016 continues to reflect the sheer diversity of STEM subjects on offer to students in our schools but it also highlights the urgent need to recruit more graduates across the UK, including young women, as we seek to find the one million engineers that the country now needs to compete in the world.

We reach out annually to around 250 students from secondary schools in east London but, this year, for the first time, we start to take the project 'national' with 150 students joining us from the north of England. We hope that the experience of visiting us at St Paul's Way will lead to new friendships and partnerships supporting similar grassroot developments in communities across the UK.

We are pleased that also joining us this year will be schools, scientists and business people connected to the nuclear power industry in Cumbria, colleagues from the National Space Centre in Leicester and colleagues from the Daresbury Science and Technology Business Park near Runcorn.

In 2017 we will continue to build the national project profile and link with the Olympic Park and the London Legacy Development Corporation. Exciting STEM career opportunities are emerging with the development of the new science and cultural quarter on the Park which will host branches of University College London, the V&A, Sadler's Wells Dance Theatre, London College of Fashion, the Smithsonian and University of the Arts London.

These are challenging times and we must do all we can to forge links at local level in east London and across the UK between these great institutions, the school curriculum, science and technology businesses and students to help drive the country forward."

Lord Andrew Mawson OBE

WEDNESDAY 27 JULY at St Paul's Way Trust School

10:00 Registration and Group 1 & 2 allocations
10:15 Welcome and Introduction
Phil Akerman, Associate Headteacher
Lord Andrew Mawson OBE

Session Four 10:30–11:20
Group 1 – Presentations

10:30 St. Paul's Way Trust School Authentic Biology student presentation
10:37 **From Genome to Clinic: Journeys Through the Oesophagus**
Dr Tim Underwood
10:56 **The Life of Flies – the Good, the Bad and the Ugly**
Dr Erica McAlister
11:14 Q&A Session and General Discussion

Session Four 10:30–11:20
Group 2 – Practical Workshops *see panel on page 5*

11:20–11:30 Groups 1 & 2 changeover

Session Four continues 11:30–12:20
Group 1 – Practical Workshops *see panel on page 5*
Group 2 – Presentations *as above*

Lunch 12:20–13:00

Session Five 13:00–13:50
Group 1 – Presentations

13:00 **Pressing FIRE on the most powerful laser in the world**
Dr Ceri M Brenner
13:19 **Following the Solar Wind from the Sun to the Earth**
Dr Ian Whittaker
13:38 Q&A Session and General Discussion

Session Five 13:00–13:50
Group 2 – Practical Workshops *see panel on page 5*

13:50–2:00 Groups 1 & 2 changeover

Session Five continues 14:00–14:50
Group 1 – Practical Workshops *see panel on page 5*
Group 2 – Presentations *as above*

Break 14:50–15:05

Session Six 15:05–15:55
Group 1 – Presentations

15:05 **Life at a Startup**
Lee Omar, Red Ninja
15:24 **The Origin of the Laws of Nature**
Professor Brian Cox OBE
15:43 Q&A Session and General Discussion

Session Six 15:05–15:55
Group 2 – Practical Workshops *see panel on page 5*

15:55–16:05 Groups 1 & 2 changeover

Session Six continues 16:05–16:55
Group 1 – Practical Workshops *see panel on page 5*
Group 2 – Presentations *as above*

16:55 Closing Address & Awards
Professor Brian Cox OBE

17:15 Close of Science Summer School 2016

"Science and everyday life cannot and should not be separated."

Rosalind Franklin
Chemist

PRACTICAL WORKSHOPS

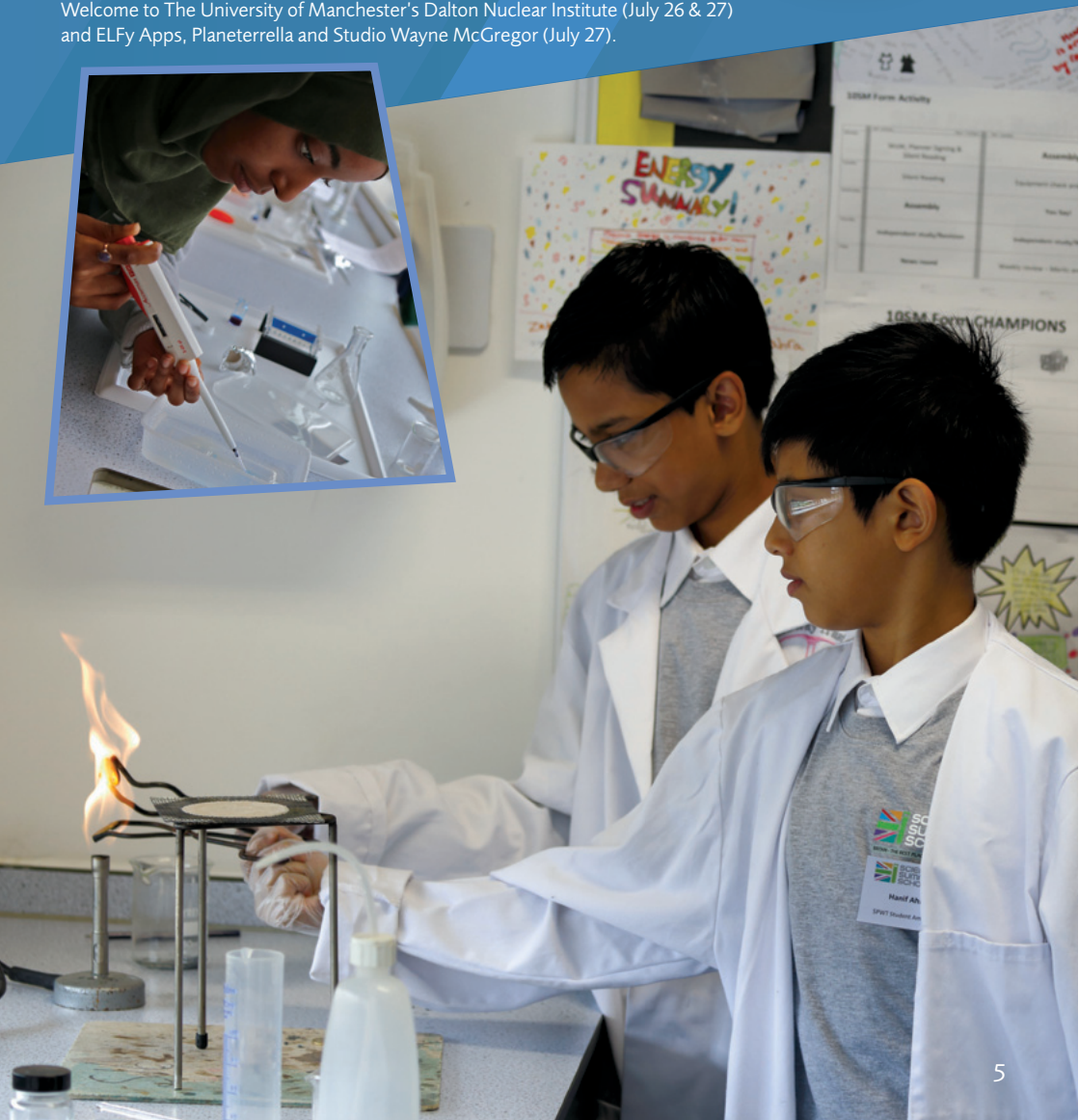
(Correct at time of press)

Tuesday 26 July: Alien Autopsy; Chemistry; Fantastic Plastics; Feeling Hot! Hot! Hot!; Frog Dissection; Gold & Silver Coins; iAdvance Robotics; Liquid Nitrogen; Mini and not-so-mini Beasts; Physical Sounds with Steve Mesure; Physics Challenge; Science Museum – Water Transporter; Surprising Science with Matt Pritchard; Trauma 999.

Wednesday 27 July: Explorer Dome; Dark Chemistry with Steve Mesure; iAdvance Robotics; MathMagic with David Hall; National Media Museum; Royal Society of Chemistry – Mission Starlight; Studio Wayne McGregor – Thinking with the Body; Tropical Animal Encounters with Chris Welbourne.

EXHIBITORS

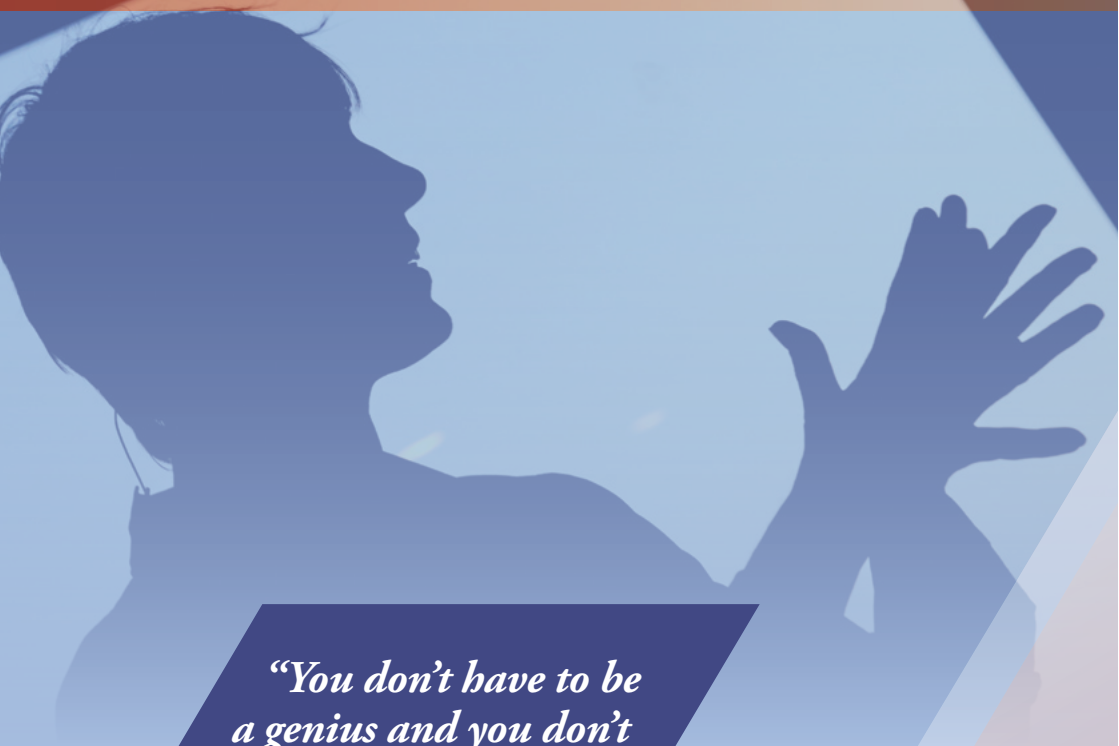
Welcome to The University of Manchester's Dalton Nuclear Institute (July 26 & 27) and ELFy Apps, Planeterrella and Studio Wayne McGregor (July 27).



"All of our GUEST SPEAKERS have been given 18 MINUTE TIME SLOTS for their PRESENTATIONS.

WHY 18 MINUTES?

It's long enough to be serious and short enough to hold people's attention. It's a format that has been adopted by the online TED LECTURES and helps ensure that speakers convey their key points in an INFORMATIVE and INTERESTING way."



"You don't have to be a genius and you don't have to be a man – science is for everyone. All you need to be is interested, and if you're interested then you can do it."

Professor Brian Cox OBE

Professor Brian Cox OBE

Professor Cox gained a first class degree in physics from the University of Manchester and was awarded a PPARC Postdoctoral Fellowship. He has worked on a plethora of major projects including the H1 experiment at DESY, HERA, the Tevatron collider in Chicago, POMWIG and the ATLAS experiment at CERN. He was awarded a Chair in Particle Physics at the University of Manchester and through his Royal Society University Research Fellowship continues his work on ATLAS and the public promotion of science.

PROFESSOR BRIAN COX OBE

Brian has received many awards for his work in publicising science. In 2012 he received both the Michael Faraday Prize of the Royal Society for his excellent work in science communication, as well as the Institute of Physics President's medal where he made a speech about the value of education in science and the need to invest more in future generations of scientists. He was appointed an Officer of the British Empire for services to science in 2010 and is a Fellow of The Royal Society.

Professor Cox also has a distinguished career in science broadcasting on television and radio. Programmes that he has written and presented include the BBC documentaries "Wonders of the Solar System", "Wonders of the Universe", "Wonders of Life", "Human Universe" and most recently "Forces of Nature" broadcast on BBC One in 2016. He is the co-author of "Why Does $E=mc^2$?", the bestselling "Wonders of the Solar System", "Wonders of the Universe", "Wonders of Life", "Human Universe" and "Forces of Nature".

Professor Cox was an ambassador for the UK Young Scientists and Engineers Fair, fronting the campaign to promote take-up of STEM subjects in schools.

Dr Steven Le Comber

Steve's work covers a wide range of subjects within evolutionary biology, including mathematical and computer models of molecular evolution and studies of spatial patterns in biology, notably in epidemiology and invasive species biology. His research on molecular evolution is principally in the field of genetic code evolution and polyploidy. In a recent paper in BMC Evolutionary Biology, he pointed out for the first time an apparently deleterious feature of the universal genetic code: the occurrence of multiple stop codons. The paper proposed and found evidence for a compensatory benefit for this otherwise puzzling feature of the code.

DR STEVEN LE COMBER

Steve's work on the mathematics of spatial patterns spans two main areas and in the first of these, has pioneered the introduction of geographic profiling – a statistical technique originally developed in criminology – to biology. He is currently using geographic profiling to study biological invasions and epidemiological data. In the second of these areas, he uses fractal dimension to quantify burrow architecture in fossorial mammals. Previously, he has studied alternative male mating tactics in the three-spined stickleback, patterns of morphological and molecular evolution in European vespertilionid bats and mate choice in the greater horseshoe bat.

Dr Turi King

Turi is Lecturer in Genetics and Archaeology at the University of Leicester. She is best known for leading the project carrying out the whole genome sequencing of Richard III at the University of Leicester. Turi read Archaeology and Anthropology at Cambridge, before gaining a distinction in her MSc in molecular genetics at the University of Leicester. Her PhD research in genetics at Leicester resulted in an award-winning thesis examining the link between British hereditary surnames and the Y chromosome.

DR TURI KING

"Somewhere, something incredible is waiting to be known."

CARL SAGAN
ASTRONOMER

Professor Paul Monks

Paul Monks is Professor in Atmospheric Chemistry and Earth Observation Science at the University of Leicester. His research interests include chemistry and transport and climate and atmospheric chemistry. Paul is the current co-chair of the IGBP-International Global Atmospheric Chemistry programme and chair of the DEFRA Air Quality expert group as well as being a member of the UK Space Agency, Space Leadership Council and NERC Council.

Paul has recently been appointed as the European representative on the Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC SSC).

PROFESSOR PAUL MONKS

Anna Hill

Anna is an entrepreneur, innovator and award-winning artist-designer with 15 years of space industry experience. She is the Director and Co-Founder of River Cycleway Consortium Ltd. (UK) and her experience spans the international space, creative, entertainment, and education industries. Anna has established herself as a highly regarded leader and creative strategist in sustainable and user-centered design products and services. In particular, her specialty is "bringing space to Earth" in the space awareness, education and sustainable design markets.

She partnered with renowned architect David Nixon and established the UK environmental firm River Cycleway Consortium Ltd in 2012. In a collaboration they initiated in 2008, the duo applied their expertise to conceptualize and develop the recently proposed and critically acclaimed "Thames Deckway Project", a clean-energy generating floating cycle path and flood emergency relief system backed by Britain's leading engineering firm Arup and Hugh Broughton Architects.

Anna is an experienced and accomplished public speaker and entrepreneur. She started up "Space Synapse" supported by the European Space Business incubator and the Digital Hub in Dublin. In 2005 she relocated the company to work in the Netherlands based at the *European Space Research and Technology Centre (ESTEC).* Since returning to London UK she established Earth Rider, a cross platform educational offering with support from NASA and ESA. For full credits visit www.earthrider.eu

Anna was recently nominated as a RSA fellow.

ANNA HILL

DR TOM PHILP

Dr Tom Philp

Tom is a Science Analyst at XL Catlin, a specialty insurer/reinsurer underwriting complex risks all over the world. Tom obtained his PhD from the Department of Meteorology at the University of Reading, during which he investigated the surface wind structure of European windstorms.

In the past he has worked as a researcher at NOAA's Hurricane Research Division, using observations obtained by Hurricane Hunter flights to investigate occurrences of eyewall meso-vortices.

At XL Catlin, Tom utilises his scientific background and training to help validate catastrophe models, to provide input on insurance pricing and to help underwriters assess natural peril risk in a changing environment.

He is currently the insurance sector champion for the EU Copernicus Climate Change Service led by the European Centre for Medium Range Weather Forecasting (ECMWF) and has recently been working with Colorado State University and Barcelona Supercomputing Centre to set up a website which aggregates seasonal forecasts for North Atlantic hurricanes.

Dr Tim Underwood

Tim was appointed as a Medical Research Council Clinician Scientist in 2011. He trained in General Surgery in London and Southampton and has subsequently specialised in Upper Gastrointestinal Surgery with a particular interest in oesophageal cancer and minimally invasive surgical techniques. He combines surgery with laboratory based research into how "normal" cells in tumours support cancer growth. He has helped understand the oesophageal cancer genome and is currently working to apply single-cell sequencing techniques to new cancer models.

From August 1st 2016 he will become Professor of Gastrointestinal Surgery at the University of Southampton.

DR TIM UNDERWOOD

"Now is the time to understand more, so that we may fear less."

Marie Curie
Physicist and Chemist

Dr Erica McAlister

DR ERICA McALISTER

Erica is Collections Manager for Diptera (flies), Siphonaptera (fleas), Myriapoda (centipedes & millipedes) and Arachnida (spiders and their kin) at the Natural History Museum in London. She manages a team of five specialists and a collection of between three to four million specimens which is one of the largest and most important collections in the world.

She specialises in flies and has many interests within this family. Her research has included topics such as pollinating flies in Ethiopia, working on mosquito vectors in Tajikistan and determining fly pests and pollinators of Solanaceae in Peru. She is constantly collecting new species/specimens for the collection and is working on describing a group of Robber Flies from Australia.

Erica is also very much involved with outreach work, both in the UK and abroad and has just come back from a month teaching and collecting in the Caribbean. She has worked in television and on radio and appears in live science shows across London.

DR CERI M BRENNER

Dr Ceri M Brenner

Ceri is a physicist and passionate public speaker. She works on the border of research and innovation, alongside leaders in the field of high power laser plasma physics as well as with academics and technical directors within some of the UK's largest R&D companies.

Ceri is a founding member of the ScienceGrrl initiative, whose message is 'Science is for everyone' and Chair of the Thames Valley Branch of the British Science Association. She is also treasurer for the Institute of Physics Plasma Physics Group, which supports the UK plasma physics community in hosting workshops, conferences and conducting outreach, and founder and director of the Students@Harwell network, bringing together the student community across the site of the Harwell Campus in Oxfordshire.

Ceri contributes to physics outreach and communication whenever she can through radio, TV, Youtube, Twitter, public talks and campaign groups.

DR IAN WHITTAKER

Dr Ian Whittaker

Dr Ian Whittaker is a Postdoctoral Research Fellow at the University of Leicester. His current research topic is investigating X-ray emission from the Earth's upper atmosphere. This work is in preparation for the upcoming European Space Agency and Chinese Academy of Sciences mission, SMILE (Solar wind Magnetosphere Ionosphere Link Explorer) of which he is an investigator on the X-ray detector instrument. His previous research areas have included the upper atmosphere of Venus, oscillations in the solar corona, the Earth's radiation belts, lightning in tropical cyclones and magnetic resonance imaging.

LEE OMAR

Lee Omar

Lee grew up in Liverpool where he went to a regular comprehensive school and did not know anyone who had been to university. He went on to work in the human rights sector for 11 years supporting refugees to rebuild their lives.

Lee is now Chief Executive Officer of Red Ninja, an innovative company which creates technology for smart cities and digital health. He works with the UK Government Chief Scientific Adviser on the Foresight Future of Cities programme which advises government on technological change up to 2065.

Lee lectures at the University of Oxford on Future Technology and advises the Indian Government on Smart City technologies and business models at President and Chief Minister level. He also works with Google in Silicon Valley on the research and development of future technologies.

As a self-taught app developer, Lee creates apps to help people become healthy and for cities to be sustainable. He also has a weekly slot on BBC radio discussing technology trends.

"No problem can withstand the assault of sustained thinking."

VOLTAIRE
PHILOSOPHER

Lord Andrew Mawson OBE

Andrew is a serial social entrepreneur. He is best known for founding the Bromley-by-Bow Centre in east London, Community Action Network (CAN) and Poplar Harca (one of the first housing companies). Andrew has now "graduated" from most of these ventures and each of them continues as a successful organisation. He has now created Andrew Mawson Partnerships as a vehicle both to grow and to replicate his approach and successes.

Under the AMP banner, he launched Water City CIC to create and implement a vision for east London revitalised by the opportunities of the 21st Century and the 2012 Olympic Games. Andrew was made a life Peer in 2007 in recognition for the social impact of his work and he now sits as an independent crossbench Peer in the House of Lords. In 2012, he was made a Freeman of the City of London. He is also the bestselling author of the book, "The Social Entrepreneur: Making Communities Work".

Andrew is a Director of the London Legacy Development Corporation. In 2006 he was asked to lead the St Paul's Way Transformation Project bringing together, in a joined-up project, the physical improvements along St Paul's Way; creating new networks and relationships between the agencies and local residents, and pursuing a coordinated vision for the future of the area. St Paul's Way Trust School, home of Science Summer School, is a key element in this project. Andrew is now the Executive Chairman of Well North, a public health programme and is taking his experience in east London and using it to work with local people to develop 10 pathfinder projects in challenging communities in the north of England. For Andrew, nothing is impossible. His favourite saying is, "live dangerously or do not live at all".

Special Thanks

The St Pauls Way Trust School is very grateful for the support of XL Catlin, Lloyd's Register Foundation, J.P.Morgan, Foundation for FutureLondon, National Lottery, North West Coast Academic Health Science Network, Well North, Andrew Mawson Partnerships, ArcelorMittal Orbit, the London Legacy Development Corporation, The University of Manchester and The React Foundation.

We are very grateful to the Lloyd's Register Foundation for their continued support of the Science Summer School. The Lloyd's Register Foundation helps to protect life and property by supporting engineering-related education, public engagement and the application of research.

Foundation for FutureLondon is pleased to support the Science Summer School with Professor Brian Cox, giving young people the opportunity to explore new pathways and inspiring the next generation of scientists and engineers. As a proud supporter of established summer schools with local cultural organisations, we promote both the arts and sciences as opportunities to inspire local young people to engage with their surroundings and raise their aspirations. To this end, the Foundation for FutureLondon is working with existing cultural collaborators from east London, as well as future partners: the V&A, Sadler's Wells, UAL's London College of Fashion and UCL. Together, our partners are highlighting a new way of working, developing the building blocks for long term partnerships, and highlighting the collective endeavour of culture-led regeneration.

Project Management: Richard Mallett Arts Management Ltd
Design: Trout Design Ltd
PR Consultant: Barnie Choudhury
Sponsorship Consultant: Nick Ryan, Vantage Fundraising Ltd
Programme Photography: Elizabeth Norden

St Paul's Way Trust School is a Royal Society School and the first Faraday Science School in London. We lead the way in delivering an innovative and engaging science curriculum and providing access to state-of-the-art facilities for our students.

The Faraday project is named after the pioneering chemist and physicist Michael Faraday, who himself grew up in London and worked in the East End. Our Faraday status has allowed us to change how science and technology is taught. We provide practical, project-based learning opportunities and encourage our students to develop a lifelong interest in science.

In March 2013 Ofsted graded St Paul's Way Trust School as 'Outstanding' in all categories and in 2014 the school was designated a 'Teaching School' and invited to be part of the Mayor of London's 'Gold Club'. The school has undergone a £40 million rebuild as part of the St Paul's Way Transformation Project in Tower Hamlets.

In September 2014 the school became a 'Through School' offering us the exciting prospect of working with others to develop new approaches to primary science. Our annual Science Summer School is an important part of this work introducing young scientists, from our school and partner schools in east London and now from schools in other parts of England, to the work of leading internationally renowned scientists.

Our ambition of fostering links between science, education and the local community has taken another step forward with the recent opening of the St Paul's Way Trust Science Research Centre. This centre, designed by our lead Trust Partner Queen Mary, University of London, enables students from St Paul's Way Trust and other schools to engage in exciting and challenging research, including our Wellcome Trust funded 'Authentic Biology' project; our research focus within the centre also includes our work on 'Type 2 Diabetes'.

This Science Summer School is proudly supported by:

XL CATLIN

Lloyd's Register Foundation

J.P.Morgan

FOUNDATION FOR FUTURELONDON

BIG LOTTERY FUND
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WellNorth

Andrew Mawson Partnerships

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and **St Paul's Way CIC** **www.stpaulsway.com**