Crossing Science Boundaries

24th July – 7th August

2013

LIYSF

London International Youth Science Forum

The London International Youth Science Forum

Founded in 1959, LIYSF aims to give a deeper insight into science and its applications for the benefit of all mankind and to develop a greater understanding between young people of all nations.

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Prof. Viji Thambyraja BSc PhD LLB MHPEd FRSC CChem
Prof. Neil Williams

LIYSF Science Advisor:
Dr. Arthur Tarrant PhD FIstD FCIBSE FSLL CPhys CEng

The following countries will be represented this year:

Australia
Austria
Bangladesh
Belgium
Brazil
Canada
Chile
China
Columbia
Croatia
Cyprus
Denmark
Egypt
England
Estonia
Germany
Guernsey
Guyana
France
Hong Kong
Hungary
India
Indonesia
Iran
Ireland
Israel
Italy
Jamaica
Japan
Kenya
Lithuania
Luxembourg
Malaysia
Malta
Mexico
Nepal
Netherlands
New Zealand
Nigeria
N. Ireland
Norway
Pakistan
Philippines
Poland
Portugal
Romania
Scotland
Serbia
Singapore
Slovakia
South Africa
Spain
Sweden
Switzerland
Thailand
Tunisia
Turkey
USA
Wales

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The Prime Minister
2010 - Present

10 DOWNING STREET
LONDON SW1A 2AA
www.number10.gov.uk

THE PRIME MINISTER

July 2013

I would like to welcome you all to this year's London International Youth Science Forum and encourage you to make the most of the time which you will spend in London. These two weeks present an exciting opportunity for you to meet with colleagues from across the globe, develop new friendships and partnerships for the future.

You are in a unique position to actually experience what it means to 'Crossing Science Boundaries' and I believe the theme of this year's event could not have come at a better time. In order to solve some of the most important global challenges, we need to develop innovative solutions which draw on principles and expertise from across all science disciplines and all parts of the world.

I hope that you have a successful forum

President
Professor Richard O'Kennedy

Biomedical Diagnostic Institute,
Dublin City University,
July, 2013.

It gives me great pleasure, as President, to welcome you to the London International Youth Science Forum 2013.

Currently there are huge issues that need to be addressed in relation to the quality of life on earth and how we are impacting it, with our ever increasing demands for resources and the manner in which we handle our wastes. Science offers us a way to effectively generate workable approaches which may be of global significance. Scientists must be at the forefront of developing and applying solutions to these problems as they are often best placed to act in a concerted and cooperative manner.

LIYSF provides a unique opportunity for you to discuss major issues with young scientists from very different backgrounds, traditions and regions. You will learn from these interactions and will extend your knowledge of science and of people. Your ideas will be challenged and you may have to revise many of your opinions. This will be a significant and memorable learning experience and I know it will greatly assist you in planning your career. Hopefully it will also make you fully aware of your responsibilities as a citizen of this world.

At LIYSF you become part of an expanding international community. The friends you make will become a very important part of your life and will provide you with world-wide contacts and perspectives. I can assure you that you will have a great time at the Forum and that the more effort and enthusiasm that you put into it the more you will get out of it. I say this as a former participant who has spent all of my life closely associated with the LIYSF.

I look forward to meeting you.

Richard O'Kennedy

Richard O'Kennedy
President, London International Youth Science Forum
Professor of Biological Sciences and Director Biomedical Diagnostics Institute, Dublin City University (DCU)

LIYSF Conference Director
Richard Myhill

In 1959, what was then called the "Science Fortnight", began with the belief that "out of like interests, the strongest friendships grow", gathering students from a handful of European countries. Today in 2013, we hold the same belief, but have expanded somewhat, attracting 350 students from almost 60 countries worldwide! LIYSF has a full, rich and varied programme with incredible lectures and speakers, visits to world leading departments, debates and an engaging social programme. As Conference Director, it is my job each year to bring this all together and it is with great pleasure that I welcome you to London and hope that you have a wonderful time at the Forum.

LIYSF Science Advisor - Dr. Arthur Tarrant

For the last three decades, LIYSF has been privileged to have had the unrivalled contribution and help of Dr. Arthur Tarrant. Initially, he came to deliver his amazing lecture demonstration 'Colour is Fun', but swiftly became part of the LIYSF 'family'. Over the years, his advice, both academic and practical, has been invaluable. His enthusiasm for LIYSF has been a vital part of the event for generations of Forum participants. Dr. Tarrant remains very active in maintaining the lecture: he is after all one of Britain's greatest experts in the field! We sincerely hope that he will continue to contribute to LIYSF for a very long time to come.

Acknowledgements

LIYSF offers its thanks to all those who so generously assisted in the planning and preparation of LIYSF 2013 and in particular to:

The lecturers and speakers whose contribution is invaluable.

The universities, industries and research centres for their generosity in hosting visits to their establishments.

The schools, educational groups, science competitions and foundations worldwide, which select and sponsor overseas participation.

Mr John Needle for his continued support, enthusiasm and consultancy in the preparations of the London International Youth Science Forum.

The schools, colleges and local authorities who nominate candidates from Britain to attend LIYSF and the industrial, commercial and charitable institutions who sponsor their attendance.

Imperial College London for working with LIYSF in providing facilities for plenary and specialist lecturers and for seminars.

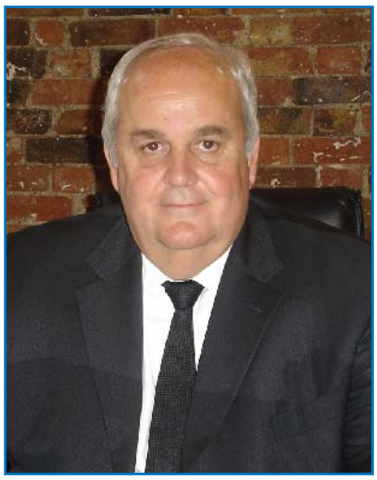
The Royal College of Music for working with LIYSF to provide a venue for our Opening Ceremony and International Cabaret.

The European Commission which sponsors the attendance of prize winners from the EU Contest for Young Scientists.

The British Council for its support and assistance in many countries, where participation is made possible through its involvement.

The George McGowan Memorial Fund for UK schools sponsorship.

Director
Mike Clark



July 2013

Over the years, I have had the privilege to listen to many eminent scientists addressing the London International Youth Science Forum. As they have outlined their work, the one consistent message highlighted is that major scientific developments have relied on collaboration - through multi disciplinary and international collaboration.

It is therefore apt and not before time that we have chosen as this year's LIYSF theme "Crossing Science Boundaries".

Here at LIYSF, with almost 60 countries represented, there is no better viewpoint to consider your future career in science. We have an engaging and full programme prepared for you. Leading scientists from around the world will be ready to share their expertise, findings and theories, as well as challenge you to make you own minds up on some of science's "big questions". You will be able to consider how you can best equip yourself to learn and adapt in this ever-emerging multi disciplinary environment.

Science is at the heart of our programme with lectures from eminent scientists and researchers, visits to some of the world's leading universities and research organisations, combined with a rich social programme. Equally important, are the friendships you will make here and what you will learn from each other amid the diverse cultures that LIYSF brings together.

The programme can only come to life with your energy, enthusiasm, questions and contributions, so please enjoy your time in this exciting capital city and join together as you debate, consider, learn and socialise at LIYSF.

A very warm welcome to LIYSF 2013.

Mike Clark
Director of LIYSF

Programme of Events

Wed 24th July	10.00hrs – 16.00hrs	Arrivals
	19.30hrs – 20.30hrs	Welcome in Halls of Residence
Thurs 25th	11.00hrs – 12.30hrs	LIYSF Opening Ceremony, Britten Theatre, Royal College of Music
		Key Note Address Professor Christofer Toumazou Welcome Address Sir Keith O'Nions
	14.30hrs – 15.30hrs	Programme Introductions, Health and Safety Briefing, The Great Hall
	15.30hrs – 17.30hrs	Lecture/Demonstration: Professor Sir Chris Llewellyn Smith: 'Science Crossing Borders – Intellectual/Technical and International'. The Great Hall
	17.30hrs – 18.30hrs	Sale of Optional Excursions. The Great Hall
	20.30hrs – 00.00hrs	Welcome Party, Metric, Imperial Student Union
Fri 26th	09.00hrs – 13.00hrs	Visits to Research & Scientific Establishments in London
	15.00hrs – 17.00hrs	Lecture/Demonstration - Professor Nancy Papalopulu: 'Understanding How a Gene Regulatory Network may Provide a Tunable Timer for Neural Differentiation'. The Great Hall
	19.30hrs – 22.00hrs	The Science Forum Bazaar - Student Project Poster Board Evening Imperial College Atrium / Mechanical Engineering Foyer
Sat 27th	10.00hrs – 12.00hrs	Lecture/Demonstration - Professor Gianfranco Bertone: 'Behind The Scenes of The Universe: The Worldwide Race to Discover Dark Matter' SAF Lecture Theatre
	14.00hrs – 16.00hrs	Optional London Sightseeing Tour and London Eye
	19.30hrs – 20.00hrs	European Patent Office Lecture Session - Lenora Reville: 'Learning About Patents'. SAF Lecture Theatre
	20.00hrs – 22.00hrs	Student Topics. SAF Lecture Theatre
Sun 28th	09.00hrs – 17.00hrs	Optional visit to Stonehenge & Salisbury
	19.00hrs – 21.00hrs	Student Debate Evening, led by Sir Colin Terry and Dr. Turi King 'Unlocking the Debate about King Richard III's Bones'. SAF Lecture Theatre
Mon 29th	10.00hrs – 16.30hrs	Specialist Study Day: 'Crossing Science Boundaries'. Led by Sir Colin Terry SAF Lecture Theatre
	19.30hrs – 22.00hrs	Great Crossword Treasure Hunt. Queen's Lawn
Tues 30th	08.00hrs – 18.00hrs	National Visits to Research & Scientific Establishments
	19.30hrs – 22.30hrs	Optional Theatre night

Principal Lectures and Demonstrations | Specialist Lectures | Visits

Wed 31st	10.00hrs – 12.00hrs	Specialist Lectures. Sir Alexander Fleming and Skempton Building
	14.00hrs – 16.00hrs	Lecture/Demonstration - Professor David Phillips: 'A Little Light Relief' SAF Lecture Theatre
	19.30hrs – 20.30hrs	British Council Lecture Session. SAF Lecture Theatre
	20.30hrs – 21.00hrs	Imperial College London, Studying in the UK Session
	21.00hrs – 21.30hrs	Royal Society of Chemistry Session
Thurs 1st Aug	08.00hrs – 17.30hrs	Day Visits to Oxford & Cambridge Research and Scientific Establishments
	20.00hrs – 22.00hrs	Rehearsals. Union Concert Hall, Student Union
Fri 2nd	10.00hrs – 12.00hrs	Specialist Lectures. Sir Alexander Fleming and Skempton Building
	13.30hrs – 15.00hrs	Lecture/Demonstration - Professor Trevor Jones: 'Medicines for the Developing World, Challenges, Dilemmas and Solutions'. SAF Lecture Theatre
	15.30hrs – 18.00hrs	Visits to Science & Natural History Museums
	20.30hrs – 22.00hrs	International Cabaret – Cultural Showcase Performance Evening The Britten Theatre, Royal College of Music
Sat 3rd	10.30hrs – 12.30hrs	Lecture/Demonstration - Dr. Andrew Hanson: 'Colour is Fun' SAF Lecture Theatre
	15.00hrs – 17.00hrs	LIYSF Olympics. Ethos Sports Hall
	20.00hrs – 22.00hrs	Lecture/Demonstration - Dr. Cyril Isenberg: 'The Magic of Soap Bubbles'
Sun 4th	09.00hrs – 16.00hrs	Optional visit to Stratford Upon Avon
	20.00hrs – 22.00hrs	Traditions of Home – Sharing World Customs and Fashion Metric, Imperial Student Union
Mon 5th	10.00hrs – 12.00hrs	Specialist Lectures. Sir Alexander Fleming and Skempton Building
	14.00hrs – 16.00hrs	Optional Visits to State Rooms at Buckingham Palace, London Eye and The Shard
	19.30hrs – 22.30hrs	Optional Theatre Night
Tues 6th	10.00hrs – 12.00hrs	Participant's Forum. SAF Lecture Theatre
	14.30hrs – 16.00hrs	Lecture/Demonstration – Professor Lord Robert Winston. SAF Lecture Theatre
	16.00hrs – 17.00hrs	Closing Ceremony. SAF Lecture Theatre
	20.00hrs – 00.00hrs	Farewell Party. Metric, Imperial Student Union
Wed 7th	08.00hrs – 10.00hrs	Departures

Social Programme

Optional Visits

Opening Ceremony

Key Note Address

Professor Christofer Toumazou

Science Crossing Borders - Intellectual/ Technical and International

The global demographic trend towards ageing populations, coupled with less active lifestyles and fast-food diets, is leading to higher probability and earlier onset of chronic conditions such as Type 2 diabetes and cardiovascular disease. The presentation will review some attempts to provide sensor processing solution stemming from the semiconductor CAS microchip industry. A revolution in genetics and molecular biology is currently being driven by the confluence of advances in life science and semiconductor technologies. The reduction in sequencing costs continues unabated and one of the most promising approaches utilizes the Ion-Sensitive, Field-Effect Transistor technology. Toumazou was able to demonstrate for the first time label-free DNA amplification, detection and sequencing based upon principles well known to the semiconductor industry. His invention has resulted in the fastest growing DNA sequencing technology to date. Other disruptive technologies include a body worn wireless disposable 'digital' plaster which has FDA approved and a silicon based artificial pancreas. Technology trends and business models for such rapid lab free tests will be discussed.

Christofer Toumazou is currently the Founding Director and Chief Scientist at The Institute of Biomedical Engineering, Imperial College London, Founder and Executive Chairman of Toumaz Technology and Chairman and CEO of DNA Electronics. He is also director of the Winston Wong Centre for Bio Inspired Technology. He has published over 700 research papers and holds 40 patents in the field of semiconductors and healthcare, many of which are now fully granted PCT. Chris is distinguished for his ground breaking innovations in silicon technology and integrated circuit design. At 33, Chris became one of the youngest ever Professors at Imperial College London.

Chris is the founder of three technology based companies with applications spanning ultra-low-power mobile technology. He has received many awards including: The Royal Society Clifford Patterson Prize Lecture. He is the recipient of the 2005 IEEE CAS Education Award for pioneering contributions circuits and systems for biomedical applications. He received the Royal Academy of Engineering Silver Medal in 2007. The IET Premium best paper award and the IEEE CAS outstanding young author award. Elected in 2006 to Academia Europea.

Welcome Address

Sir Keith O'Nions

President & Rector

Imperial College London

President and Rector, Sir Keith O'Nions, has led Imperial College London since 1 January 2010, after joining the College in July 2008 to set up and direct a new Institute for Security Science and Technology.

Sir Keith holds an undergraduate degree in geology from the University of Nottingham and a PhD in earth sciences from the University of Alberta, Canada. After completing his PhD he took up a Postdoctoral Fellowship at the University of Oslo before moving to the University of Oxford in 1971 as a Demonstrator and then Lecturer in geochemistry. He subsequently became Professor of Geology at Columbia University in 1975, Royal Society Research Professor at Cambridge in 1979 and Head of Earth Sciences at Oxford in 1995.

Sir Keith held the position of Chief Scientific Advisor to the Ministry of Defence between January 2000 and July 2004. He then moved to the Department of Trade and Industry, later known as the Department for Innovation, Universities and Skills, to become Director General, Science and Innovation, and Chief Scientific Advisor.

He has been the Chairman, or a member, of a number of Research Council committees over the last 25 years, including a member of the Council of Science and Technology from 1998 to 2000 and was Trustee and then Chairman of the Natural History Museum from 1996 to 2005.

He became a Fellow of the American Geophysical Union in 1979 and a Member of the Norwegian Academy of Science and Letters in 1980. He is a Fellow of the Royal Society (1983), Honorary Fellow of the Indian Academy of Sciences (1998), Fellow of the Indian National Science Academy (2001) and Honorary Fellow of the Royal Academy of Engineering (2005).

He was knighted for services to earth sciences in the 1999 Queen's Birthday Honours.

Imperial College London

Imperial College London was founded in 1907 and today is consistently rated amongst the world's best universities. Imperial College London is a science-based institution with a reputation for excellence in teaching and research. With over 14,000 full time students from 126 different countries, studying one of its 242 courses, it really is a world class centre of excellence.

Royal College of Music

The Royal College of Music is a conservatoire that trains musicians for international careers. Since its foundation in 1882 by the Prince of Wales and later Edward VII, the College has been linked with the Royal family. The current patron is Her Majesty, The Queen. With around 750 students from 64 countries studying at undergraduate, postgraduate or doctoral level, the RCM is a community of talented and open-minded musicians where excellence, individuality, creativity and diversity are prized.

Principal Lectures and Demonstrations

Thursday 25th July

Professor Sir Chris Llewellyn Smith

Science Across Boundaries

Science crosses intellectual, technical and political boundaries. To illustrate the importance of science that crosses disciplinary boundaries, we will consider the challenge of meeting future energy demand in an environmentally acceptable manner, which will require expertise from across the social and natural sciences. As an example of many cases in which discoveries and tools from one field have crossed boundaries and made major impacts in others, we will consider synchrotron radiation. Finally, Professor Sir Chris Smith will describe SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) as an example of science bringing people together across political boundaries.

Chris Llewellyn Smith is Director of Energy Research, Oxford University, and President of the Council of SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East). He has chaired the Council of ITER, the global fusion energy project, directed the UK's fusion programme, and served as Provost and President of University College London, Director General of CERN (1994-1998, when the Large Hadron Collider was approved and construction started), Chairman of Oxford Physics. His theoretical contributions to the 'standard model' of particle physics were recognised by his election to the Royal Society in 1984. He has written and spoken widely on science funding, international scientific collaboration and energy issues, and served on many advisory bodies nationally and internationally, including the UK Prime Minister's Advisory Council on Science and Technology (1989-92).

Saturday 27th July

Professor Gianfranco Bertone

Behind The Scenes of The Universe: The Worldwide Race to Discover Dark Matter

An extraordinary discovery has recently shaken the foundations of Cosmology and Particle Physics: the Universe is filled with an unknown, elusive substance that is fundamentally different from anything we have ever seen with our telescopes or measured in our laboratories. It is called dark matter and identifying its nature constitutes one of the most pressing challenges of modern science. Gianfranco will consider whether this may mean a pivotal paradigm shift in physics, as we set out to test the existence of some of the most promising dark matter candidates with a wide array of experiments, including the LHC at CERN, as well as with a new generation of Astroparticle experiments.

Gianfranco is an Associate Professor at the University of Amsterdam. After a PhD at the University of Oxford and the Institute of Astrophysics in Paris, he has held teaching and research positions at the Fermi National Accelerator Laboratory, the University of Padova and the University of Zurich, before going back to Paris as a permanent CNRS researcher. In 2011, he joined the new Center of Excellence in Gravitation and Astroparticle Physics of the University of Amsterdam. He is the editor of "Particle Dark Matter: Observations, Models and Searches" and editor-in-chief for journal "Physics of the Dark Universe". He has recently authored the book: "Behind the Scenes of the Universe, From the Higgs to Dark Matter".

Friday 26th July

Professer Nancy Papalopulu

Understanding How a Gene Regulatory Network May Provide a Tunable Timer for Neural Differentiation

The nervous system is built during embryogenesis by neural progenitor cells, which proliferate and give rise to differentiated, specialized cells, such as different types of neurons. These no longer divide, but carry out the functions of the nervous system. The correct development of the nervous system requires a balance between progenitor cell proliferation and differentiation. How is this balance controlled, how are progenitors cells maintained for the appropriate length of time and how do they decide when to differentiate? Nancy will present how advances in the ability to visualize gene expression in real time have informed our views of how these processes might work.

Nancy Papalopulu is a Professor of Developmental Neuroscience at the Faculty of Life Sciences, University of Manchester. She did her PhD at the National Institute for Medical Research, UK and a post-doc at the Salk Institute for Biomedical Research, US. She was a Group Leader at the Wellcome Trust/Cancer Research UK Gurdon Institute, in Cambridge from 1997-2006. She is Wellcome Trust Senior Research Fellow and was elected to EMBO in 2012 and to the Medical Academy of Sciences in 2013. Her main research interest is the molecular control of vertebrate neurogenesis, in particular, the mechanisms that underlie the maintenance of neural progenitors during development.

Saturday 27th July

Lenora Reville

Learning about Patents

As students have creative minds and will inevitably arrive at innovative ideas, this lecture is aimed at describing one way in which to protect these ideas. This lecture will describe what a patent is and the purpose of a patent. The lecture focuses on awareness of patents and the important aspects to be considered by the inventor when deciding on applying for a patent, a crucial point being that the innovative idea is not disclosed publicly before applying for a patent.

Ms Reville is a Senior Patent Examiner at the European Patent Office. She joined the EPO in The Hague in 2000 upon graduating as an electronic engineer from University College Dublin. She works in the Telecommunications field presently in power management of radio transmission systems and previously in optical transmission systems, corpuscular radiation communication e.g. quantum communication.

Principal Lectures and Demonstrations

Sunday 28th July

Sir Colin Terry and Dr. Turi King

Student Debate

Debate session with Dr. Turi King, moderated by Sir Colin Terry.

When the University of Leicester Archaeology Service undertook the Grey Friars project, it was thought that the chances of finding the remains of King Richard III were slim. Nevertheless, on February 4th, 2013, Turi King was part of the team which presented the results of the DNA analysis of Grey Friars Skeleton 1, that these were the remains of King Richard III. With the finding of the remains of a former King of England comes a whole series of debates: where should he be reinterred, should the public be allowed to see the remains, should distant relatives have a say on the remains, should distant relatives have a say in where he is reburied? Join us for the debate and give your opinion.

Wednesday 31st July

British Council, Imperial College London and Royal Society of Chemistry Session.

BRITISH COUNCIL

One of the British Council's five charitable purposes is to encourage cultural, scientific, technological cooperation between the UK and other countries. Science is a valuable hook for engagement across the wide portfolio of our work, through STEM education initiatives; science and arts work; research partnership programmes; policy dialogues; supporting the capacity building of institutions; skills development and mobility of early career researchers.

RSC | Advancing the Chemical Sciences

The RSC is the largest organisation in Europe for advancing the chemical sciences. Supported by a worldwide network of members and an international publishing business, our activities span education, conferences, science policy and the promotion of chemistry to the public.

Imperial College London

Imperial College London was founded in 1907 and today is consistently rated amongst the world's best universities. Imperial College London is a science-based institution with a reputation for excellence in teaching and research. With over 14,000 full time students from 126 different countries, studying one of its 242 courses, it really is a world class centre of excellence.

Wednesday 31st July

Professor David Phillips

A Little Light Relief

Light, particularly sunlight, has always occupied a mystical power over all civilisations and is commonly held to bestow good health upon recipients of its rays. That there is both truth and fallacy in such beliefs will be demonstrated in this lecture which deals with the science of photo-medicine. The subject encompasses effects of light on the skin; diagnostic uses of light and therapeutic aspects.

David Phillips is a graduate of the University of Birmingham, B.Sc Chemistry 1961, Ph.D 1964, Honorary D.Sc, 2011. He carried out post-doctoral work at University of Texas 1964-6, and the Institute of Chemical Physics, Academy of Sciences of USSR 1966/7, before beginning teaching/research at the University of Southampton. In 1980, he became Wolfson Professor of Natural Philosophy at the Royal Institution, and in 1989 became Hofmann Professor of Chemistry at Imperial College London, and subsequently; Head of Department, Dean for the Faculties of Life Sciences & Physical Sciences and Senior Dean. He is author of some 590 articles and reviews, and received the Porter Medal of the European, Oceanic, and Inter-American Photochemistry Associations 2010. He was awarded the Royal Society's Michael Faraday Award in 1997, was awarded an OBE in 1999, and CBE in the 2011/12 New Year's honours list. He is the immediate Past-President of the Royal Society of Chemistry.

Friday 2nd August

Professor Trevor Jones CBE

Medicines for the Developing World, Challenges, Dilemmas and Solutions

Infectious Diseases such as HIV AIDS, malaria and tuberculosis are a major cause of morbidity and mortality in the developing world. Whilst these infections have been, and continue to be, the subject of very active research and development to counter bacterial, viral and protozoal resistance, there exist a number of other infectious diseases such as river blindness and sleeping sickness which, to an extent, have been "neglected". In recent years, several new international initiatives have been established through public: private partnerships between pharmaceutical companies, universities, governments and charitable foundations to tackle these issues, but problems remain.

Professor Jones is former Director General of The Association of the British Pharmaceutical Industry (ABPI) and now serves on the Boards of Pharmaceutical Companies in USA and Europe. He is a visiting professor at King's College, London and holds honorary degrees and Gold Medals from 6 universities. He was R&D Director of The Wellcome Foundation, a founder member of the Medicines for Malaria Venture, served as a Commissioner for the World Health Organisation (WHO) and a member of a number of UK Government Groups including The Medicines Commission and Chair of the Government Advisory Group on Genetics Research. He was honoured by Her Majesty Queen Elizabeth II by the award of a CBE in 2003.

Principal Lectures and Demonstrations

Saturday 3rd August

Dr. Andrew Hanson

Colour is Fun!

Colour informs, influences consumer choices, warns us and comforts us. As with every aspect of life, it needs to be measured to ensure good communication and confidence in manufacturing processes for a diverse range of goods from pills to paints. But how do we ascribe numbers to a human perception which is incredibly versatile and variable? The challenge is enormous and human colour perception science is still a lively topic today. Be warned! This demonstration talk will contain surprises - there is a lot more to colour than meets the eye.

For 25 years, Andrew has been professionally measuring colour, from evaluating the appearance of ornamental plants, to building the world's first national standards telespectroradiometer to calibrate the colour of visual display units and a machine to measure the shininess of cats. He is currently Outreach Manager and Occasional Senior Scientist at the National Physical Laboratory, the UK's National Measurement Institute and is past Chairman of the Colour Group of Great Britain.

Tuesday 6th August

Professor Lord Robert Winston

Cross-over Biology

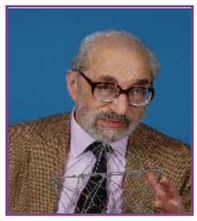
Lord Winston is Professor of Science and Society and Emeritus Professor of Fertility Studies at Imperial College London.

He developed gynaecological surgical techniques that improved fertility treatments, in vitro fertilisation (IVF) and developed pre-implantation diagnosis. He now runs the Institute of Reproductive and Developmental Biology, Imperial College. He has over 300 scientific publications and is Chairman of the Genesis Research Trust. He is a Royal Society Faraday Medal holder. Other awards include a Wellcome Senior Research Fellowship, a Blair-Bell Lectureship RCOG, the Cedric Carter Medal, Victor Bonney Medal, Royal College of Surgeons of London Gold Medallist, Edwin Stevens Medal, Zoological Society's gold medallist (04) and Al Hammadi Gold Medal - Royal College of Surgeons of Edinburgh (05).

Robert is a Fellow of the Academy of Medical Sciences, Queen Mary College, Royal Academy of Engineering, Society of Biology, Royal College of Surgeons of Edinburgh and Glasgow. He has received 17 honorary doctorates from universities worldwide and has been a visiting professor at American, Australian and European universities. Past President of British Association for the Advancement of Science and is Council member and Chairman of the Societal Issues Panel at the Engineering and Physical Sciences Research Council and Chancellor of Sheffield Hallam University.

He speaks regularly at the House of Lords. He was Chairman of the Lords Select Committee on Science and Technology (99-02). He is a board member and Vice-Chairman of the Parliamentary Office of Science and Technology and was voted "Peer of the Year" by his fellow Parliamentarians in 2008.

Saturday 3rd August



Dr. Cyril Isenberg

Magic of Soap Bubbles

Everyone has enjoyed blowing bubbles. The scientific and artistic communities have also been fascinated by films and bubbles, from nuclear physicists to cosmologists and from architects to artists.

This lecture will demonstrate, on a large scale, their vibrational properties, their equilibrium and non-equilibrium surfaces and their colours. Application to solving roadway problems will also be given.

Dr. Isenberg is a solid state theoretical physicist. He gained his qualifications and early postdoctoral research experience at King's College, University of London. He subsequently worked as a resident research associate at the Argonne National Laboratory, near Chicago, Illinois, in the USA. However, most of his career was spent on the staff of the Physics Laboratory of the University of Kent at Canterbury, UK.

Monday 29th July - Crossing Science Boundaries Specialist Study Day

10.00hrs Sir Alexander Fleming and Skempton Building

Lecture A

Sir Colin Terry

Mechanical Engineering

Sir Colin is a Chartered Engineer and was Chairman of the Engineering Council UK (2002-2005). In July 2004, he took over Chairmanship of Meggitt PLC, an international aerospace company in the FTSE 100, with revenue in 2012 of £1,700 million.

He has had wide experience in the public sector attaining the rank of Air Marshal (3 star General) and was Chief Engineer and Head of Logistics for the RAF with a budget of £2 billion, a workforce of 16000 based on 20 sites, responsible for over 1500 aircraft. He was a National Director of Engineering for Eurofighter and responsible for bringing the AWACS, Hercules 130J and Chinook Mk 2 into service in USA.

He is currently the Chairman of the Military Aviation Authority Safety Committee and a Director of Fox Marble. He has also advised HM Government at Cabinet level on key national and international initiatives. Sir Colin graduated in Aeronautical Engineering at Imperial College London, where he is a Fellow as well as a Fellow of the Royal Academy of Engineering. He has been a Council Member for Cranfield University, City and Guilds Institute London and Royal Aeronautical Society (and Chairman). A Deputy Lieutenant for Buckinghamshire, he is also President of the County SSAFA. He was awarded the KBE, CB and OBE (for services in the Falklands).

Lecture B

Dr. Bob Bloomfield

Why Biodiversity is the Issue of the Day and the Solution for Tomorrow

Bob will explore the crisis in biodiversity loss, looking at the evidence for and the impact of biodiversity loss, and particularly the consequences for global environmental change and to sustainable development. He will explore how new approaches are using science-based evidence to account for the services of nature - providing new ways to support conservation efforts. The emergence of the concept of ecosystem services is reshaping international policy and allowing to potentially create a new way of managing environmental economic affairs from a global to a local scale.

Dr. Bloomfield is known internationally for his work leading science and society programmes at the Natural History Museum London where he was Creative Director for some of its major public developments, including Charles Darwin 2009 celebrations and in 2010 led the UK response to the International Year of Biodiversity. Bob was invited to give evidence to the UK House of Lords Select Committee report on Science in Society 2000 and was awarded a NESTA fellowship (02-05). In 2012, Dr Bloomfield received an OBE in the Queen's Birthday honours list. He is currently an independent adviser on environmental engagement to a number of private organisations and in England's Department of Environment - Defra.

Lecture C

Professor Tony Cass

What do Arsenite in Drinking Water and Glucose in the Skin have in Common?

The answer is that if the concentration of either is too high, the consequence for the health of millions of people worldwide is extremely serious.

Furthermore, specific enzymes that oxidize both substances exist in nature and can be exploited to build sensors that can be used to measure them and so inform strategies that result in their levels being lowered. These devices (biosensors) use the enzymes to generate electrical currents whose size is proportional to concentration. Despite the similarities, there are also important differences; the arsenite sensing needs to be very low cost (most drinking water contamination occurs in resource poor countries) and suitable for use by relatively untrained individuals. In contrast, glucose measurements in the skin needs to be made in a near continuous fashion but with minimal inconvenience, pain and discomfort.

Tony Cass is Professor of Chemical Biology and his research is in the field of analytical science with a focus on simple but powerful devices that can be used outside the laboratory. Current projects include the arsenite and glucose sensing work described above, as well as a rapid animal influenza detection system and a device for measuring the level of drugs in the body to achieve better therapeutic results in treating disease.

Lecture D

Dr. Matteo Guidotti

Heterogeneous Catalysis - Interior Design at Molecular Level

Nanochemistry is a scientific field in endless expansion. Chemists preparing heterogeneous catalysts are interior design architects "at nanometric level". The house is the porous solid material constituting the backbone of the catalyst. The furniture is the catalytically active site where the transformation of the reactants into products takes place. The use of the space corresponds to the study of the physico-chemical characteristics useful to tune and optimize the catalytic performance. The final users are the molecules diffusing in and out the nanometre-sized network of pores. Catalyst preparation has been considered for a long time as one of the last strongholds of alchemy. Now the chemist can choose the best combination of parameters in order to design and develop the most suitable catalyst for a specific reaction.

Born in 1972, Matteo studied in Milan where he received his Degree in Chemistry in 1997 and his PhD in Industrial Chemistry in 2000, with periods as visiting researcher in France, Russia, Spain and the Netherlands. His work deals with the study and development of heterogeneous catalysts for the synthesis of fine chemicals and the transformation of renewable raw materials. He is author of 77 scientific publications and 95 communications at international congresses, President of the Foundation for Scientific and Technical Education and Culture (Milan) and Secretary of the Region Lombardy Section of the Italian Chemical Society as well as Officer of the SMOM Auxiliary Corps of the Italian Army.

Monday 29th July - Crossing Science Boundaries Specialist Study Day

10.00hrs Sir Alexander Fleming and Skempton Building

Lecture E

Professor Greg Hughes

The Role of the Semiconductor Device in the Information Age

Semiconductor electronics has transformed many aspects of our lives and has revolutionized the way we work and socially interact. This lecture charts how the development of the information age, which begun with the invention of the 1st transistor in 1947, has depended on applied physics research.The extraordinary achievements in semiconductor device manufacturing will be highlighted as well as some of the major technological challenges facing the continued development of this industry. Examples of future applications of emerging semiconductor device technologies will be reviewed and how their deployment will continue to impact on the way we live our lives.

Prof. Greg Hughes holds a BSc in Chemistry and a PhD in semiconductor physics from the University of Ulster, Northern Ireland. Following a two year post-doctoral position in the IBM research division at Yorktown Heights, he joined the School of Physical Sciences at Dublin City University where he still works. He spent a sabbatical year at the Technical University of Berlin on an Alexander von Humboldt research fellowship in 1994 and was a Visiting Research Professor at Boston University in 2001 and 2003. He is the author of over 120 research papers in the field of surface science and his current research team is working on projects relating to the characterisation of novel materials for use in the semiconductor device industry.

Lecture G

Professor Chris Rawlings

Are they Waving or Drowning? Can Biologists Learn to Swim in the Sea of Life-Science Data?

New instruments, laboratory robots, multi-spectral real-time imaging systems and other technologies are, with the Internet, transforming the biological sciences. As more and more experimental data are born digital, the analysis and interpretation of big data requires biologists to use complex software and databases on a routine basis. In many situations, biologists either need to have computational skills to deal with the huge volumes and diversity of data they use or have to develop multi-disciplinary teams around them to provide the computational or mathematical skills that are needed to progress their research. In this lecture, Chris will explain how biology is being transformed into a data-intensive science, how this is being tackled by the research community and discuss the impact this has for the skills needed by aspiring life-science researchers.

Chris started a research career in Bioinformatics at the Imperial Cancer Research Fund in 1982 and from 1996 led Bioinformatics groups in the Pharmaceutical and Biotechnology sectors until joining Rothamsted Research in 2004. Chris now leads a Computational and Systems Biology department which comprises over 25 staff and students engaged in research into, and application of, computing, mathematical modelling and statistics to problems in crop improvement and sustainable agriculture. His personal research interests are in the development and use of data integration techniques for supporting data-intensive bioscience.

Lecture F

Dr. Spencer Polley

Quest for New Diagnostics; Why, How and When

The incorporation of new technologies into clinical diagnostics is seeing a revolution in patient care, with significant increases in speed, sensitivity and accuracy of the final diagnostic output. Such advances allow more timely and appropriate management of patients, with significant benefits to their wellbeing. We will consider how these advances are being applied to tackle the treatment of infectious diseases, especially in the developing world and what potential multidisciplinary research has to play in the management of human health in such challenging settings.

Spencer Polley specialises in the development of new molecular based products/procedures to improve the diagnosis of human parasitic diseases. He has worked on developing assays for such events as the 2012 Olympics. He most recent work has been involved in the development of Loop Mediated Isothermal Amplification of DNA (LAMP), a sensitive and robust isothermal nucleic acid amplification technology for the diagnosis of diseases such as malaria and chagas disease. Such novel technologies may provide the sensitivity, ease and speed of diagnosis necessary to circumvent mass treatment regimes for the elimination of these diseases.

Wednesday 31st July Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture A

Professor Graziella Branduardi -Raymont

Space Astronomy and the Exotic Universe

Scientists in virtually all branches of astronomy make use of instruments in space to learn more about the Universe. This lecture focuses on x-ray and gamma-ray astronomy, explains the basics of how observations are carried out in space and describes some of the recent results from space observatories built by the European Space Agency (ESA) and NASA.

Cosmic X-ray and gamma-ray sources are some of the most energetic, violent and exotic objects in the Universe: the densest stars, around which energy production is more efficient than in nuclear reactors, the hot debris of the explosive death of stars; streams of charged particles precipitating in the powerful magnetic fields of planets, giving rise to bright x-ray aurorae; the still mysterious ways black holes are born in mighty bursts of gamma-rays; they all provide us with clues about the origin and, ultimately, the fate of our Universe.

Graziella has been fascinated by astronomy and space research since childhood. After a degree in Physics at the University of Milano, Italy, and a PhD in x-ray Astronomy at University College London (UCL), she worked at the Center for Astrophysics, Harvard University, USA and then returned to UCL Mullard Space Science Laboratory (MSSL) where she has been based ever since.

Lecture B

Professor James Durrant

Harnessing the Sun: Molecules and Nanostructures for Solar Energy Conversion

The development of renewable, low cost energy technologies is a key scientific and technological challenge. Solar energy is the most scaleable and widely available of renewable energy sources; however its diffuse nature makes harnessing it cost effectively a significant challenge. Currently, most solar energy conversion technologies are based upon silicon solar cells. James talk will be discuss the development of alternative molecular and nanostructured materials for solar energy conversion, including both those to produce electricity (photovoltaics) or molecular fuels (e.g.: hydrogen). James will draw upon parallels with plant photosynthesis, the lessons we can learn from nature and discuss how new materials such as molecular semiconductors and nanostructured metal oxides are enabling the development of new approaches to solar energy conversion.

James Durrant is Professor of Photochemistry in the Department of Chemistry, Imperial College London and Deputy Director of Imperial College's Energy Futures Lab. Following undergraduate studies in Physics, his PhD and postdoctoral studies focused on the primary processes of plant photosynthesis. He joined the Chemistry Department in 1999, where he established an interdisciplinary research group focusing upon chemical approaches to solar energy conversion.

Lecture C

Jameer Emamally

Engineering our Lives

How do discoveries made today become tomorrow's reality? How does science move from the classroom to something you can touch, feel, something that can help you solve a problem, investigate an idea, meet the needs of a city, a person or a company? This interactive lecture will give you an introduction to engineering and an awareness of the design process as we go on a brief journey to take an idea from concept design and learn to create an application.

Jameer has a strong background in engineering and management, with a good track record of working in collaborative teams on both the national and international level. Jameer has project managed complex teams to deliver key submarine systems and has worked on a number of defence projects in various phases of the product lifecycle. During his career, he has worked in research and development, business development, concept, system and detailed design for the defence, nuclear and civilian industries and across varying disciplines.

Lecture D

Dr. John Ingram

Interactions between Food Security and Environmental Conditions

The session will cover the two-way interactions between human activities related to food security (in the context of the 'food system') and environmental conditions (in the context of 'planetary boundaries'). The seminar will highlight the range of ways our food system activities contribute to crossing the planetary boundaries and introduce some of the impacts of crossing these boundaries for food security. It will also examine options to adapt our food systems to changes in environmental parameters and to mitigate further deleterious changes.

John Ingram gained extensive experience working in East/Southern Africa and South Asia in agriculture, forestry and agroecology research projects. In 1991, he was recruited by the UK's Natural Environment Research Council (NERC) to help organise and coordinate research on global change and agroecology as part of International Geosphere-Biosphere Programme. In 2001, he was appointed Executive Officer for the Earth System Science Partnership's Joint Project 'Global Environmental Change and Food Systems' (GECAFS). On the close of GECAFS in 2011, he assumed a new role as 'NERC Food Security Leader'. John is now based in the Environmental Change Institute, University of Oxford, UK.

Wednesday 31st July Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture E

Dr. Tom Ingram

Is This My Heart?

In this lecture, we will examine one of the world's biggest killers - ischaemic heart disease, reflecting upon the evolution of our understanding of angina and heart attacks. We will join Mr Smith as he has his heart attack; looking at the pathology behind his presentation, the treatment which he receives and the complications which can occur. Then we will look to the future, on the one hand exploring the exciting therapies of stem cell transplantation and reperfusion injury limitation. However, an appreciation will also be given as to why, despite the significant advances we have made, the rate of decline in the incidence of heart disease has slowed and may even be on the rise again (especially in the young). The worrying prediction that this could be the first generation to be outlived by their parents should sharpen all of our minds as we enter an uncertain future.

Dr. Ingram graduated from the University of Leeds in northern England. He was selected onto the All Wales specialist training programme in Cardiology. Most recently, he has been awarded a three year competitive research grant from the British Heart Foundation to look into blood flow characteristics during times of reduced oxygen supply to the heart.

Lecture F

Professor Marcus Rattray

Drugs on the Brain, the Brain on Drugs

Drugs have been used recreationally since the earliest history of mankind. Although many drugs are illegal and harmful, they are widely used and abused, especially amongst young people. In this lecture, Marcus will explore the world of drugs of misuse from a neurobiological and pharmacological perspective. What are they? How do they interact with the brain? Why do some people develop addictions? How can we best treat substance misuse?

Marcus Rattray is a Professor of Pharmacology and Head of the Bradford School of Pharmacy. He graduated with a BSc in Biochemistry at the University of Leeds followed by a PhD in Neuroscience at the University of London. After a postdoctoral research fellowship at the National Institutes on Drug Abuse in Baltimore, he became a Lecturer in Biochemistry and set up his own lab at St Thomas' Hospital, University of London, later moving to Guy's Hospital and joining the Wolfson Centre for Age-related Diseases in 2004. In 2008, he became Reader in Pharmacology at Reading School of Pharmacy before joining the University of Bradford in 2013.

Lecture G

Stacy Williams

Beating the Financial Markets

The analysis of financial markets was once the preserve of economists. Increasingly, however, mathematicians and physicists are bringing their skills to bear. Global markets behave as a single, interdependent, highly complex system and the methods developed by scientists and engineers to model physical systems can be employed. In this seminar, we look at how complex systems techniques are used to gain deep insights into financial markets and how they can be applied to make better and more profitable investment decisions.

Stacy Williams is Head of FX Quantitative Strategy at HSBC. He is responsible for quantitative research and the development of systematic trading models and algorithms. Stacy also supervises doctoral research in collaboration with the University of Oxford Centre for Industrial and Applied Mathematics (OCIAM).

Friday 2nd August Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture A

Professor Freya Blekman

Research at the Knowledge Frontier: Particle Physics at CERN

CERN is one of the world's largest research laboratories in the world, with 10,000 scientists researching fundamental physics and the theory of structure of matter, space and time. We will look at the current problems and questions of fundamental physics - which we are currently trying to solve at CERN, using the Large Hadron Collider. We will focus on how the research done at CERN affects our understanding of the world around us, what it is like to be a particle physicist at CERN and how we interpret the collisions at the LHC.

Freya Blekman is a particle physicist specialised in the search for new particles at the Large Hadron Collider and also works a lot on the study of top quarks, the most massive particle currently known. Originally from Amsterdam, Freya received a PhD at the Dutch National Institute for Particle Physics for work done at Fermilab, Chicago, USA. After having worked as a researcher for Imperial College and Cornell University (USA), she now works with CERN as Professor of Particle Physics associated with the Vrije Universiteit Brussel (VUB) in Brussels.

Lecture B

Maurice Brown

You Are Talking Air - The Impact of Hydrogen Fuel Technology on Our Future

The Hydrogen fuel cell has been around since 1839. This relatively obscure, but highly valued technology, played an important role in powering the United Space programme from the 1960's and still today. The technology holds great promise, as it presents a real alternative to fossil fuel energy. However, the industry will face a tough future. Promoters of this energy source must master the learning curve of the energy industry, if it is to become a feasible alternative. Hydrogen fuel cell technology has the potential to radically alter our energy landscape. How does this technology work, what are its applications and what problems does it face as an industry?

Maurice Brown was born and raised in Kingston Jamaica, studying at Campion College and the College of Arts Science and Technology. He moved to the Netherlands in 1994 and completed his Bachelors degree in International Business Administration and Masters Degree in Business Management. He has a fascination for aviation and space exploration. He became a consultant to the aviation industry and later, held financial positions in various international companies. Currently, he is lecturer in Finance and Business Strategy at the University of Applied Sciences, Utrecht, (Netherlands) and is owner of a small company looking into promoting and exporting to developing countries.

Lecture C

Judith O'Toole

Animals Don't Read the Text Books

In recent years, the veterinary world has provided us with many examples which illustrate how nature and science are constantly changing. The emergence of new diseases in recent years has shown us that we can never afford to become complacent, believing that if we know the facts of a subject today, we will know them tomorrow. This seminar will take a look at the history of veterinary medicine and explain how scientific advances have helped to reveal mysteries of the past. We will discuss the evolution of new pathogens, whilst also considering the understanding of certain diseases as merely a new way of looking at old information.

Judith graduated with a Degree in Veterinary Science (Bristol) in 1990. Judith worked as a veterinary surgeon until 1998. She obtained a Post Graduate Diploma in Education (UCD)1998, set up Diploma in Veterinary Nursing in UCD 2001-2003, teaching Science in Mount Temple Comprehensive School 1998 to present.

Lecture D

Dr. Stephan Priebe

Aircraft Aerodynamics

Modern aircraft benefit from advances in several branches of engineering and the physical sciences, such as materials science, combustion physics, electronics and systems, and aerodynamics. In this lecture, we will discuss a range of topics in aerodynamics: from the fundamental question of how lift is generated and why an aircraft flies (the popularized explanation given in some pilot manuals and popular science books is unsatisfactory) to some more advanced topics such as super- and hypersonic aircraft and re-entry vehicles. We will also look at Computational Fluid Dynamics (CFD), which is an important tool in research and design. CFD allows the flow about a wing or any other aircraft component to be simulated numerically on a computer.

Stephan is currently a Research Associate at the University of Maryland (USA), where he works in the areas of aerodynamics and CFD. He performs numerical simulations of high-speed turbulent flows to investigate their physics. After obtaining his Master's Degree in Aeronautical Engineering from Imperial College in London, he has recently completed his PhD in Mechanical & Aerospace Engineering at Princeton University (USA). In 2000, Stephan was a participant at LIYSF. In subsequent years (2001-2004), he returned as a member of the Student Staff and was Chief of Staff in 2004.

Friday 2nd August Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture E

Sam Meyler

Common Threads in Science and Art: Perspectives from the Brain

One of Sam's current interests is where science and art overlap; and the common role of the brain in both artistic and scientific pursuits. What can art teach us about the brain? What does neuroscience have to tell us about creativity and the creative "state"? Throughout the discussion Sam will introduce some empirical data that attempts to capture cognitive changes resulting from artistic processes, using traditional psychophysics models.

Sam Meyler is currently a neuroscience researcher at the Champalimaud Centre for the Unknown in Lisbon Portugal. Having graduated as a conservational biologist, he worked in various places throughout Africa with endangered mammals. Later, he moved to Paris and studied physical movement and theatre, of which he now currently teaches various courses in Lisbon and abroad. He also ran his own theatre company for a number of years.

Lecture F

Mike Minett

Pain Genes: Exploring the Mechanisms of Pain Transduction

Over one-third of the world's population suffers from persistent or recurrent pain, costing the American public alone approximately £100 billion each year in health care, compensation and litigation. These pains can last for months or years and reduce the sufferer's quality of life immensely and can lead to secondary symptoms such as anxiety and depression. Our ability to treat these chronic pain states is currently limited, with treatment options that commonly trigger side effects.

Mendelian heritable pain disorders have provided insights into human pain mechanisms and suggested new analgesic drug targets. By focusing on these individual genes it is possible to dissect the mechanisms that contribute to chronic pain. Specifically targeting drugs against these key gene products may enable us to provide pain relief without affecting normal physiological functions.

Mike graduated in 2007 with a degree in Biomedical Science from the University of East Anglia, Norwich. He then worked for a Cambridge based biotechnology company. In 2008, he joined Prof. Wood's lab at University College London, working as a a PhD student and has subsequently worked on projects there and at the University of Oxford.

Lecture G

Dr. Simon Vaughan

Biotechnology in Advanced Crop Science

Without urgent improvements to modern farming, current levels of population growth, climate change and natural resource depletion will lead to inevitable food shortages and conflict. Achieving global food security is an immediate problem, not simply a crisis in the making. Unpredictable and insufficient production of staple crops currently threatens the economic, ecological and political stability of many countries and the livelihoods of millions.

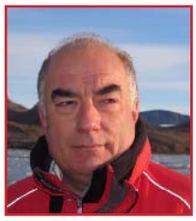
At Rothamsted Research we aim to provide the scientific knowledge and innovation needed to increase crop productivity and quality whilst developing environmentally sustainable solutions for agriculture.

Simon is Head of International Programmes at Rothamsted Research and Assistant Director at the Norman Borlaug Institute for Global Food Security. His research background is in plant molecular biology focusing on the regulation and expression of transgenes in GM plants (under the safety of novel foods programme), the application of molecular markers for conservation genetics in woodland tree species and more recently on the role of plant hormones in determining wheat grain size and quality.

Monday 5th August Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture A



Dr. Simon Boxall

Sea Level Science

The study of our oceans is one of the most challenging and important areas of science today. From climate change to waste materials in our coastal seas, the oceans have been critical in understanding our environment for many years. More recently new reserves of rare earth materials, oil and gas, and new pharmaceutical discoveries from marine plants and animals have brought oceanography and marine biology to the fore. A well managed ocean environment is also capable of providing the world population with its daily food needs.

Oceanographers need to have a good grounding in all areas of science, being able to synergize data and information from biology, chemistry, mathematics and physics. It is this broad approach that makes a life in marine science different to any other.

Dr. Simon Boxall is a lecturer in Oceanography at the University of Southampton in the National Oceanography Centre. He has carried out research in areas as diverse as Arctic sea-ice melt, ocean circulation, detection of phytoplankton from aircraft, coastal dynamics and oil spill monitoring. Geographically, he works literally pole to pole. He is responsible at the Centre for public understanding and has appeared in over 50 television documentaries and several hundred national and international news items on radio and television relating to the oceans.

Lecture B

Dr. Katrina Charles

Water Security in a Changing Climate

As humans, we depend on water not just for drinking water, but also for maintaining hygiene, agriculture, transport, manufacturing and much more. Changes to our climate will impact on how much water is available, and when it is available, through changes in the frequency and intensity of storms, floods and droughts. We need to improve our management of our water resources globally to ensure our water security. In this activity, we will cook up a (virtual) feast, using water footprints to explore how much water has been used in growing each crop and where it has come from. We will see how our choices about what we eat (or wear, or buy) here make an impact overseas and what that means in a changing climate.

Dr. Katrina Charles is an environmental engineer who specialises in how to improve drinking water and sanitation services in the developing world. Her work considers not just technical solutions, but how communication and regulation ensure that they are implemented effectively.

Lecture C

Dr. Rocio Diaz-Chavez

Sustainability Assessment of Bioenergy Projects

Renewed interest in biofuels has been motivated by different concerns such as high oil prices, energy security and the effects of climate change. Though the use of biomass has many arguments in favour, the possible negative social and environmental implications obscure these positive possibilities.

To guarantee sustainability different mechanisms and tools need to be considered. The topics covered in the session will include; 1. How to assess the main sustainability issues addressed in the use of biomass resources for biofuels production 2. How bioenergy crops could contribute to improve agriculture, foster rural development and help improve local conditions in developing countries and 3. Environmental issues of bioenergy crops production.

Dr. Rocio Diaz-Chavez is a Research Fellow at the Centre for Environmental Policy of Imperial College London and MSc tutor for the Distance learning MSc of the Centre for Development, Environment and Policy at the School of Oriental and Asian Studies.

Lecture D

Professor Roland Clift

Energy in the Low Carbon World

This session will start by outlining the long term challenge of moving towards a low-carbon economy. The key role of the energy sector will be discussed, with the challenge of changing our practices in the use of energy and developing and adopting cleaner sources of energy, including renewables and also unconventional fossil sources such as oil sands and shale gas. Differing approaches are appropriate in different countries.

Professor Roland Clift is Emeritus Professor of Environmental Technology and founding Director of the Centre for Environmental Strategy at the University of Surrey. He was previously Head of the Department of Chemical and Process Engineering at the University of Surrey and is Visiting Professor at Chalmers University, Göteborg, Sweden and Adjunct Professor at the University of British Columbia, Vancouver, Canada; Executive Director and past President of the International Society for Industrial Ecology; past member of the Royal Commission on Environmental Pollution, UK Ecolabelling Board and Science Advisory Council of Defra. His research is concerned with system approaches to environmental management and industrial ecology, including life cycle assessment and energy systems.

Monday 5th August Specialist Lectures

10.00hrs - Sir Alexander Fleming and Skempton Building

Lecture E

David Garlovsky

Solar Technologies

Renewable energy technology and energy efficiency are key in humanity's efforts to tackle the pressing global challenges of climate change. There is a shortfall in knowledge and direct experience of how these technologies work in the teaching environment, in creating local/national policy, on sales floors and with the general public. There is a need to up-skill workforce in renewable energy and of importance of addressing energy demand in supply chain. What changes are required in demand to match a renewable energy resource system? Can one maintain an eco lifestyle in using e.g. 'smart' mobile phones? What choices do you have to be informed to make a little/barefoot choice?

David Garlovsky has a BSc in Biology/Chemistry, 1967; Certificate-Social Phenomenology (applied to teaching and teacher training) Philadelphia Association-London,1983; Master of Arts in Education, 1984. Teacher/Teacher Trainer in Focusing and Active Listening; Teaching Qualifications-Primary/Secondary.

David has been involved in organising outreach activities for educational establishments, community groups and the general public. Solar resources were invented that focus on STEM subjects to develop students' enterprise, innovative and problem solving skills. The approach reaches out to diverse cultural backgrounds and addresses gender issues.

Lecture F

Dr. Vanesa Magar

Impacts of Sea Level Rise and Increased Storminess on our Coasts and on Their Management and Defence

There is not only clear but also mounting evidence that sea levels are rising and that the frequency and strength of storms will be significantly affected. However, predicting when a storm will hit and how large its damage will be is not an exact science - indeed, explaining the nature of the risk of flooding and damage to those protected by flood defences is one of the major challenges facing today's coastal and river engineers. Those designing, commissioning and constructing defences and those insuring assets in the areas protected by coastal flood defences all need to have a good understanding of climate change and its impact on the reliability of coastal defences.

Dr. Vanesa Magar is a Lecturer in Coastal Engineering at the School of Marine Science and Engineering at Plymouth University, UK. She currently is involved with the MSc programmes in Coastal Engineering and Marine Renewable Energy, as well as the MEng final year course on flood risk modelling. She is currently leading an EPSRC CASE award on the reliability of coastal flood defences in collaboration with HRWallingford and is leading a number of inter-regional projects on renewable energy and coastal morphodynamics with collaborators in France and The Netherlands.

Lecture G

Walter Wehrmeyer

The Development of Alternative Visions for a Sustainable, Low-Carbon Future of 2030

The aim of this group will be to develop a small number of visions for a sustainable 2030, to then use advanced backcasting techniques to develop viable transition pathways in the pursuit of these visions. The outcome will be a set of futures and how to get there. We feel this is urgent, important and valuable, because we know from the current state of affairs that the future cannot be a continuation of the status quo and it must be a future that addresses the various aspects of current unsustainability (climate change, fossil fuels, national and personal indebtedness etc.) in a coherent and yet radical manner.

Walter Wehrmeyer is reader in Environmental Business Management at the Centre for Environmental Strategy of the University of Surrey. His research interests include organisational approaches to innovation and sustainable development, participatory approaches to decision-making and foresighting / backcasting as national strategies towards long-term change. He was Director of the Entrepreneurship in Technology, IT and Business undergraduate programme and is Adjunct Professor at the Graduate School of Business of Curtin University of Technology, Perth, WA.

Social Programme

There is an active social calendar with events designed to enable those from around the world to learn about different cultures.

Thursday 25th July
19.30hrs Welcome Party at Metric, Imperial College Student Union.

Friday 26th July
19.30hrs The Science Forum Bazaar - Student Project Poster Board Evening. Main Entrance/Atrium.

Saturday 27th July
20.00hrs Student Topics. SAF Lecture Theatre.

Monday 29th July
20.00hrs The Great Crossword Treasure Hunt, Queen's Lawn and surrounding South Kensington.

Thursday 1st August
20.00hrs Rehearsals. Union Concert Hall, Student Union.

Friday 2nd August
20.30hrs International Cabaret - Cultural Showcase Performance Evening. Britten Theatre, Royal College of Music.

Saturday 3rd August
15.00hrs LIYSF Olympics. Ethos Sports Hall.

Sunday 4th August
20.00hrs Traditions of Home - Sharing World Customs and Fashion. Metric, Imperial Student Union.

Tuesday 6th August
20.00hrs Farewell Party at Metric, Imperial College Student Union.

Scientific Visits

Friday 26th July

Visits to Research & Scientific Establishments in London

26/1 Imperial College London, Department of Chemical Engineering
See the laboratories, pilot plant and computing facilities of one of the UK's largest departments of its kind.

26/2 Imperial College London, Earth Science and Engineering
Research and teaching at one of the world's leading centres for the study of Earth Science (geoscience).

26/3 Imperial College London, Department of Life Sciences Biochemistry
One of the largest life science groups in Europe, research of full breadth of modern life science activity including, Molecular Biosciences; Cell & Molecular Biology and Ecology & Evolution.

26/4 Imperial College London, Department of Life Sciences, Division of Cell & Molecular Biology
The research at this top university department considers the development of the immune system with analysis of complex host-pathogen interactions with a focus on malaria in both mammalian hosts and insect vectors.

26/5 Imperial College London, Department of Materials: Biomaterials in Regenerative Medicine
Research into biomaterials for tissue engineering and regenerative medicine; and bio-nanotechnology for nanostructures and create nano-biomaterials.

26/6 Imperial College London, Department of Mechanical Engineering, Energies Futures Lab
Imperial Racing Green is an undergraduate run project at Imperial developing electric, fuel cell and hybrid race vehicles. Interdisciplinary project involving 100 students from 6 departments within the faculty of engineering.

26/7 The Jodrell Laboratory at the Royal Botanic Gardens, Kew
World-famous centre for botanical research and study; includes a visit to the Jodrell Laboratory.

26/8 The National Physical Laboratory
UK's principal facility in measurement and materials science. Visit state of the art facilities ensuring accuracy, consistency and innovation in physical measurement.

26/9 The Old Operating Theatre and Herb Garret
Original Operating Theatre dating from 1821, with original instruments; find out about surgery before anaesthesia and antiseptics.

26/10 The Royal Institution - The Faraday Museum
The Royal Institution's collections began almost immediately after its founding in 1799 and include apparatus and manuscripts relating to some of the most significant scientific discoveries of the last 200 years.

26/11 University College London Hospital Trust - Blood Transfusion Laboratory
The laboratory issues approximately 50,000 blood and plasma products per annum, supporting the large Haemato-Oncology Department, a tertiary referral centre for the north west London area and the large Sickle Cell and Thalassaemia Unit which transfuses more patients than any other Trust in the UK.

26/12 University College London, Jill Dando Institute of Security and Crime Science
Visit the first Institute in the world devoted to Crime Science. Research is concentrated on new ways to cut crime and increase security.

26/13 London Wetland Centre
Over 100 acres of wetland sites, with extensive populations of wild birds, plants and insects. Talk to the experts about biodiversity and conservation.

26/14 Zoological Society of London (ZSL), Veterinary Dept.
Founded in 1826, the Zoological Society of London (ZSL) is an international scientific, conservation and educational charity whose mission is to promote and achieve the worldwide conservation of animals and their habitats. Their mission is realised through groundbreaking science and active conservation projects in more than 50 countries.

Tuesday 30th July

National Visit to Research & Scientific Establishments

30/1 Airbus UK
Core activities at Filton include the design, engineering and support for Airbus wings, fuel systems and landing gear integration.

30/2 Cranfield University
Cranfield University (a wholly postgraduate institution) has a global reputation for inspirational teaching and research, industrial-scale facilities and superior links with industry and commerce. From unique cabin evacuation research to finding life on Mars, from a frost blanket for racecourses to zero-emission cars, and from the next generation of anti-landmine devices to a new blood glucose monitor, Cranfield's focus is squarely on the application of its research.

30/3 The John Innes Centre, Norwich Research Park
An independent, international centre of excellence in plant science and microbiology working to generate knowledge of plants and microbes through innovative research to benefit agriculture, the environment, human health and well-being.

30/4 The National Oceanography Centre & University of Southampton's School of Ocean and Earth Science
NOCS is the national focus for oceanography in the UK with a remit to achieve scientific excellence in its own right as one of the world's top five oceanographic research institutions.

30/5 Rolls Royce
Visit to see Rolls-Royce, from its beginnings to present day product range. See the largest collection of aero engines in the country, ranging from World War 1 era piston engines, the famous Merlin, right up to modern day jet engines.

30/6 The Rothamsted Research Centre
The longest running agricultural research station in the world, providing cutting-edge science and innovation, in areas of crop productivity and quality and sustainable solutions for food and energy production.

30/7 Solar- Active - Schools & Homes Energy Education Project
Since 1993, this project has assisted people to make informed decisions about their energy use. Students will work with Solar-Active unique flexible solar cells, which have a significant output on even a cloudy day.

30/8 Syngenta's International Research Centre at Jealott's Hill
Syngenta is the world's largest agribusiness with 26,000 employees in 90 countries. With an 80 year tradition of innovation, Jealott's Hill is the company's largest site for new agrochemical R&D and product support. Key activities at Jealott's Hill include research into discovery of new active ingredients, new formulation technologies, technical support of our product range and Seeds research.

30/9 Tilbury Power Station
The science of electricity generation at a major 100% sustainable Biomass power station. At a capacity of 750MW, the plant provides enough power for around 1.5 million households over the remainder of its lifetime.

30/10 University College London, Mullard Space Science Laboratory
Exploiting the capabilities of rockets and spacecraft as platforms for scientific instruments it strives to understand our physical environment and our place in the Universe.

30/11 University of Kent, Electronics Laboratory
Design and research in electronics and digital multimedia equipment.

30/12 University of Warwick, Electrochemistry & Interfaces/ Electron Microscopy Dept
The application of electrochemistry to the understanding of fundamental and industrially significant interfacial chemical processes at the micro to nanoscale.

Thursday 1st August

Day visits to Oxford & Cambridge University Research Departments & Scientific Establishments

CAM/02 University of Cambridge Faculty of Maths and The Isaac Newton Institute
Mathematics has been studied at Cambridge for a long time. The first figure of note is Robert Recorde (born about 1550) who is credited with the invention of the equality sign "=".

CAM/03 University of Cambridge, NIHR Cambridge Biomedical Research Centre
A partnership between Cambridge University Hospitals Foundation Trust and the University of Cambridge.

CAM/04 University of Cambridge, Scott Polar Research Institute
The Scott Polar Research Institute was founded in 1920, as a memorial to Captain Robert Falcon Scott, RN, and his four companions, who died returning from the South Pole in 1912 and is the oldest research institute of its kind.

CAM/01 University of East Anglia, School of Chemistry
The School of Chemistry prides itself on research excellence across its spectrum of activities, from synthetic chemistry and drug discovery to spectroscopy and analytical and biophysical chemistry, as confirmed by successive Research Assessment Exercises.

OX/01 Culham Centre for Fusion Energy
The UK centre for magnetic confinement fusion research and the home of the major European fusion experiment JET. It has a high technology incubator, Culham Innovation Centre and an technology transfer programme.

OX/02 University of Oxford, Botanic Garden and the Museum of the History of Science - Oxford
Houses the University's zoological, entomological and geological specimens. Among its famous features are a dodo, the first dinosaur to be scientifically described, and the swifts in the tower.

OX/03 University of Oxford, Department of Engineering Science
The Department of Engineering Science at Oxford is the only unified department in the UK which offers accredited courses in all the major branches of engineering.

OX/04 University of Oxford, Pitt Rivers Museum
The Pitt Rivers Museum cares for one of the world's great collections. It is equally famous for its celebrated displays and its leading role in contemporary research and museum curatorship.

Friday 2nd August

Visits to Science & Natural History Museums

Natural History Museum
NHM's vision is to advance knowledge of the natural world, inspiring better care of our planet with the mission to maintain and develop collections and use them to promote the discovery, understanding, responsible use and enjoyment of the natural world. The 8-storey, landmark Darwin Centre and cocoon structure is the most significant development at the Natural History Museum since it moved to South Kensington in 1881. This dramatic new public space and state-of-the-art scientific and collections facility opens its doors to reveal a whole new Museum experience for visitors.

Natural History Museum

Science Museum
The Science Museum has over 300,000 objects in its care, with particular strengths in the history of western science, technology and medicine since 1700. It has been uniquely placed to acquire objects recording the Industrial Revolution and now holds unrivalled collections in this area. Medical artefacts from all periods and cultures also form an important part of its holdings.

Science Museum

Optional Visits

LIYSF offers a varied programme of optional visits. On Thursday 25th July at 17.30hrs tickets will be on sale from LIYSF staff after the plenary lecture demonstration. Please see website for full details.

Saturday 27th July
14.00hrs London Bus Sightseeing Tour
14.30hrs London Eye

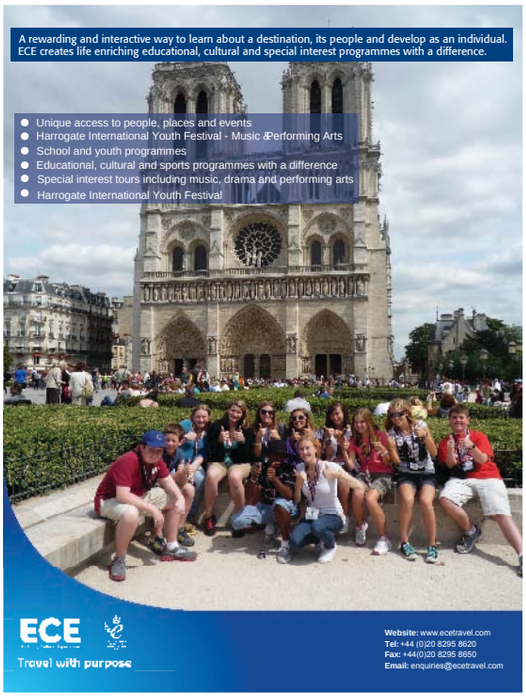
Sunday 28th July
09.00hrs Optional Visit to Stonehenge and Salisbury

Tuesday 30th July
19.30hrs Optional Theatre Night

Sunday 4th August
09.00hrs Optional visit to Shakespeare's Birthplace - Stratford upon Avon

Monday 5th August
14.00hrs Optional visit to State Rooms at Buckingham Palace
17.00hrs London Eye
17.00hrs The View from the Shard
19.30hrs Optional Theatre Night

Partners



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Nigeria

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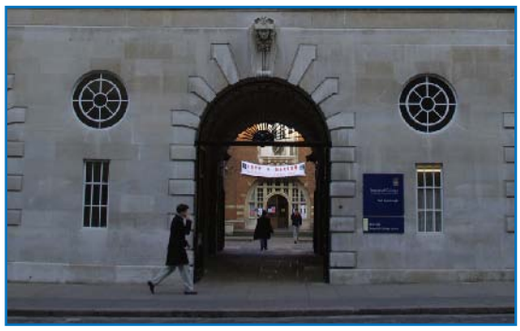
Belen Casanas
Spain

Programme Venues

HALLS OF RESIDENCE

Imperial College London
Southside Halls of Residence
Princes Gardens

Hall Host: Hattie Jones

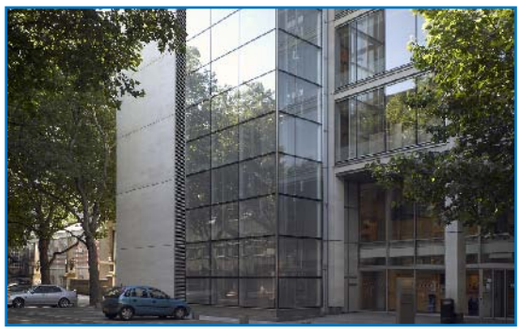


Imperial College London
Beit Halls of Residence
Prince Consort Road

Hall Host: Tom Gilbertson

PROGRAMME VENUES

Royal College of Music
Prince Consort Road



Imperial College London
Sir Alexander Fleming Building

Imperial College London

Imperial College London
Student Union

London International Youth Science Forum

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www.liysf.org.uk

56th LIYSF: 23rd July – 6th August 2014

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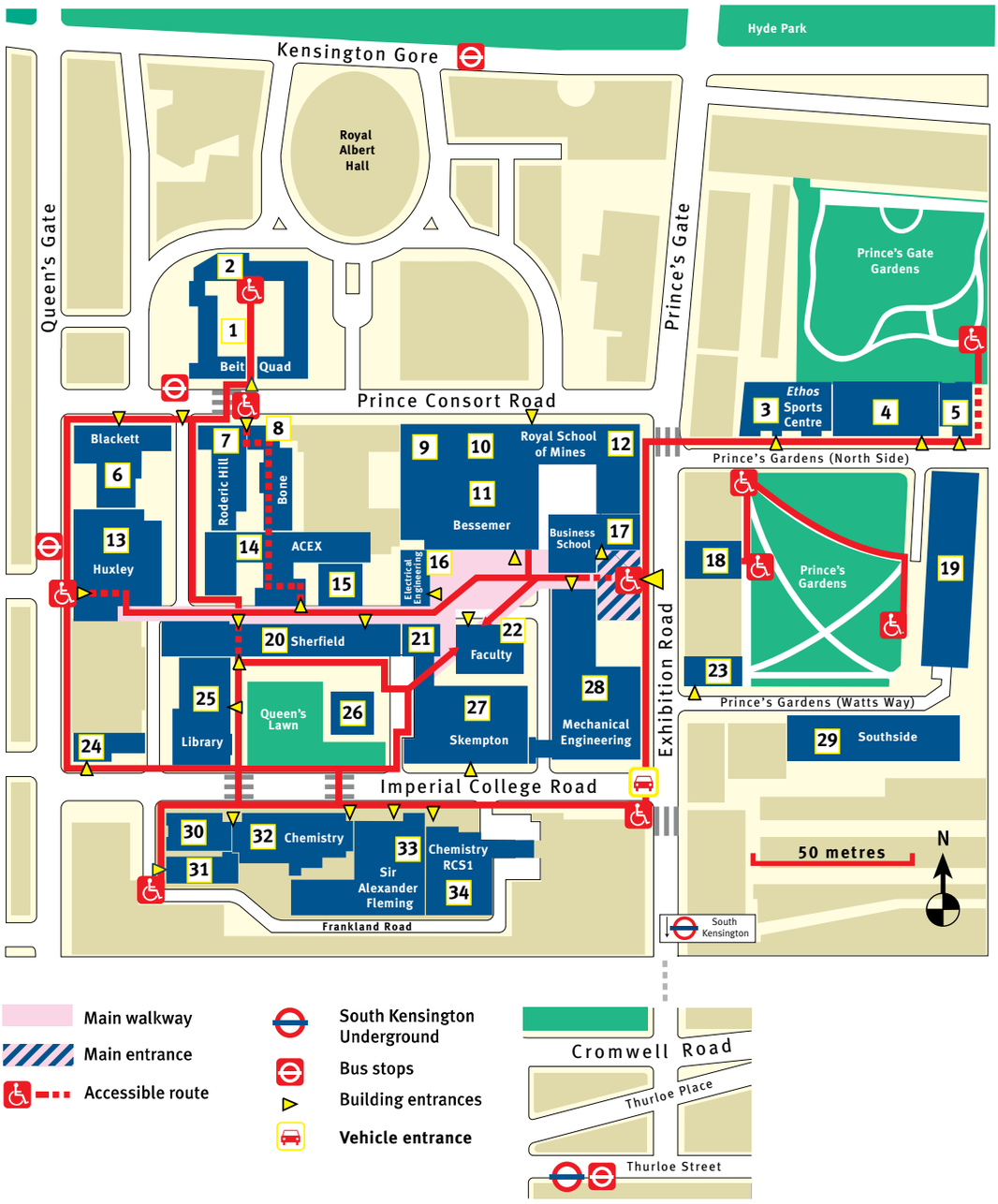

Buildings where wheelchair access is not possible at this time

1	Beit Quadrangle
2	Imperial College Union
3	*Ethos* Sports Centre
4	Prince's Gdns, North Side Garden Hall
5	Weeks Hall
6	Blackett Laboratory
7	Roderic Hill Building
8	Bone Building
9	Royal School of Mines
10	Aston Webb
11	Bessemer Building
12	Goldsmiths Building
13	Huxley Building
14	ACE Extension
15	William Penney Laboratory
16	Electrical Engineering
17	Business School
18	53 Prince's Gate
19	Eastside
20	Sherfield Building Student Hub Conference Office
21	Grantham Institute for Climate Change
22	Faculty Building
23	58 Prince's Gate
24	170 Queen's Gate
25	Imperial College and Science Museum Libraries
26	Queen's Tower
27	Skempton Building
28	Mechanical Engineering Building
29	Southside
30	Wolfson Building
31	Flowers Building
32	Chemistry Building
33	Sir Alexander Fleming Building
34	Chemistry RCS1