London International Youth Science Forum

The Human Planet

16th - 30th August

2012

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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HRH Prince Philip, Duke of Edinburgh OMKGKT, 1959-1969

Past Patron:
HRH The Duke of Kent KG, 1983-1988

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Dr. Christopher Finn BSc (hons) MSc PhD
Dr. and Mrs Mike Gluyas
Dr. Arthur Tarrant PhD FIstD FCIBSE FSLL CPhys CEng
Dr. Cyril Isenberg BSc PhIIP
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Martin Perkins MA Cmath FIMA FRSA MRI
Prof. Sir John Meurig Thomas FRS
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	Estonia	Israel	Mexico	Portugal	USA
Austria	Finland	Italy	The Netherlands	Romania	
Brazil	France	Jamaica	New Zealand	Russia	
Bulgaria	Germany	Japan	Nigeria	Serbia	
Canada	Guernsey	Korea	Northern Ireland	Singapore	
China	Hungary	Kuwait	Norway	South Africa	
Croatia	India	Lithuania	Pakistan	Spain	
Cyprus	Indonesia	Luxembourg	Philippines	Sweden	
England	Ireland	Malta	Poland	Switzerland	

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The Prime Minister
2010 - Present

10 DOWNING STREET
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THE PRIME MINISTER

August 2012

I would like to wish all of you attending this year's London International Youth Science Forum an inspiring and productive event.

It is your generation who will make future advances in science, technology and engineering. Through the pursuit of these disciplines, you will find ways to solve some of society's greatest challenges. These will include many of the issues around this year's theme; The Human Planet.

I hope that you will be able to inspire and motivate those around you to recognise both the wonders of science, and the opportunities its study opens up. In this way you can be true ambassadors for both this country, and for science, technology and engineering.

David Cameron

President
Professor Richard O'Kennedy

August, 2012.

It gives me great pleasure, as President, to welcome you to the London International Youth Science Forum (LIYSF) for 2012.

LIYSF provides a superb opportunity for you to meet and interact with young scientists from all over the world, to exchange ideas, to learn, both scientifically and culturally, and to discuss and debate some of the major issues confronting the world and scientists today. Science provides a catalyst to enhance our interactions but it must also be the focus whereby real advances can be made to overcome global problems. It is imperative that we work together because these issues cannot be resolved without world-wide collaboration and commitment.

At LIYSF the lectures, seminars, visits and other participants will constantly challenge your knowledge of science and your opinions. This is a very exciting aspect and your participation will ensure that you grow and develop both scientifically and personally. I challenge you to get very actively involved and I guarantee that you may well find it life-changing - that is what I found when I was a participant.

I am confident that coming on the Forum will be a wonderful experience and I look forward to meeting you.

Richard O'Kennedy

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

5 Acknowledgements

LIYSF offers its thanks to all those who so generously assisted in the planning and preparation of LIYSF 2012 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 advice in the preparation 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 to provide facilities for plenary and specialist sessions and accommodation.

The European Commission who sponsor 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.

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.

Directors' Welcome

Director of LIYSF
Mike Clark

Conference Director
Richard Myhill

Every year, we are delighted to offer our students a unique experience at LIYSF - in 2012 it is a very exciting time in London and we hope to reflect that in this year's London International Youth Science Forum.

Lord Browne of Madingley, in a previous LIYSF keynote address, stated that "science is the natural home for optimists" and in our view there is no better way to summarise both science and LIYSF.

Our theme this year "The Human Planet" is designed to consider the impact we have on Earth, but also how in this changing world, humans are dealing with the many challenges the Earth itself presents: biological, geophysical, climatic and extraterrestrial. We consider a new era where current approaches may not offer the same results as they once did and we will have the chance to consider what the future holds.

The future is very much in your hands. You attend LIYSF to represent your country and all of you reflect the very best in scientific ability from around the world. It may well be part of your future careers to look for solutions to some of the biggest challenges we have ever faced. Together with your peers from around the world at LIYSF 2012, your work starts now!

Great effort goes into putting together a full programme: lectures from eminent scientists and researchers; visits to some of the world's leading universities and research organisations; together with a lively and enjoyable social programme to enable everyone to share each other's rich cultures. However, LIYSF only comes to life with your energy, your thoughts and your contributions. So please, over the next two weeks, enjoy every minute and join together as you debate, consider and learn about science and look forward to seeing a truly great city, enjoying new experiences and making new friends for life.

A very warm welcome to LIYSF 2012.

Mike Clark
Director of LIYSF

Richard Myhill
Conference Director

7 Programme of Events

Principal Lectures and Demonstrations | Specialist Seminars | Visits | Social Programme | Optional Visits

THURSDAY 16th AUGUST

Arrivals

Welcome in Halls of Residence

FRIDAY 17th AUGUST

11.00hrs Opening Ceremony - Britten Theatre, Royal College of Music

14.30hrs Introductions, Programme, Health and Safety Briefing

15.30hrs Lecture/Demonstration: Professor Richard O'Kennedy: 'New Developments in Exploiting Antibodies'

17.00hrs Sale of Optional Excursions

20.30hrs Welcome Party - Metric, Imperial Student Union

SATURDAY 18th AUGUST

10.30hrs Lecture Demonstration - Dr. Peter Douglas and Dr. Mike Garley: 'Chemistry and Light'

13.00hrs Olympic Tour Optional Visit or Optional London Sightseeing Tour

20.00hrs The Science Forum Bazaar in Sir Alexander Fleming Building Foyer

SUNDAY 19th AUGUST

Optional Visit to Stonehenge & Salisbury

20.00hrs Student Topics in Sir Alexander Fleming Building Lecture Theatre

MONDAY 20th AUGUST

Visit to Research & Scientific Establishments in London

15.00hrs Lecture Demonstration - Dr. Aravind Vijayaraghavan: 'Unexpected Science in a Pencil Line'

20.00hrs Great Crossword Treasure Hunt - Queen's Tower Lawn

TUESDAY 21st AUGUST

10.00hrs Specialist Lectures

14.30hrs Lecture Demonstration - Professor Steve Cowley: 'Fusion - Powering the Future?'

20.00hrs Lecture Demonstration - Professor John Ellis: 'To Higgs or not to Higgs? That is one of the Questions'

WEDNESDAY 22nd AUGUST

Visit to Research & Scientific Establishments

Optional London Eye and Theatre Visits

THURSDAY 23rd AUGUST

10.00hrs Specialist Study Day - 'The Human Planet' led by Sir Colin Terry

20.00hrs Lecture Demonstration - Professor David Phillips: 'A Little Light Relief'

FRIDAY 24th AUGUST

Day visits to Oxford & Cambridge Research and Scientific Establishments

20.00hrs International Cabaret - Metric, Imperial Student Union

SATURDAY 25th AUGUST

10.30hrs Lecture Demonstration - Dr. Andrew Hanson: 'Colour is Fun'

15.00hrs LIYSF Olympics - Ethos Sports Hall

20.00hrs Lecture Demonstration - Dr. Cyril Isenberg: 'Magic of Soap Bubbles'

SUNDAY 26th AUGUST

Optional visit to Hampton Court & Windsor

19.00hrs Student Debate Evening - Union Concert Hall

20.30hrs Songs of Home - Union Concert Hall

MONDAY 27th AUGUST

10.00hrs Specialist Lectures

13.30hrs Lecture Demonstration - Professor Sam Evans: 'The Strange Mechanical Behaviour of Skin'

15.30hrs Visits to Science & Natural History Museums

20.00hrs Lecture Demonstration - Professor Keith Martin: 'Vision for the Future'

TUESDAY 28th AUGUST

10.00hrs Specialist Study Day - 'Managing the Warming World' led by Professor Roland Clift

Optional Theatre Visits and London Eye

WEDNESDAY 29th AUGUST

10.00hrs Participants Forum - Sir Alexander Fleming Building, Lecture Theatre

14.00hrs Closing Lecture Demonstration - Professor Trevor Jones CBE: 'Medicines for the Developing World'

15.30hrs Closing Ceremony - Sir Alexander Fleming Building, Lecture Theatre

20.30hrs Farewell Party - Metric, Imperial Student Union

THURSDAY 30th AUGUST

Departures

Opening Ceremony

Key Note Address

Professor Sir Roy Anderson FRS FMedSci

Plagues and People

The last few decades have seen the emergence and spread of a number of novel pathogens, including HIV, the SARS virus, BSE and the novel strain H1N1 of influenza A in 2009 and 2010. The lecture will discuss the factors that promote the emergence and spread of pathogens with a special focus on our changing world. Many features of our globally connected world promote both emergence and spread of viruses, bacteria and other pathogens. These include, population growth, air travel, urbanisation and livestock production and sale. The lecture will also discuss how we currently plan to combat plagues with behavioural changes, drugs and vaccines.

Sir Roy is Professor of Infectious Disease Epidemiology in the School of Public Health, Faculty of Medicine, Imperial College London. His recent appointments include Rector of Imperial College London and Chief Scientist at the Ministry of Defence, UK.

Sir Roy has also served as Director of the Wellcome Centre for Parasite Infections and the Wellcome Centre for the Epidemiology of Infectious Disease. He is the author of over 450 scientific articles and has sat on numerous Government and international agency committees advising on public health and disease control including the World Health Organisation and UNAIDS.

He currently is a Trustee of the Natural History Museum, London, a Governor of the Institute of Government London, a Member of the Singapore National Research Foundation, a Member of the International Advisory Committee of Thailand National Science and Technology Development Agency, chairs the science advisory board of WHOs Neglected Tropical Diseases programme and is a Member of the Bill and Melinda Gates Grand Challenges advisory board.

Sir Roy was elected Fellow of the Royal Society in 1986, a Founding Fellow of the Academy of Medical Sciences in 1998, a Foreign Associate Member of the Institute of Medicine at the US National Academy of Sciences in 1999 and a Foreign Member of the French Academy of Sciences in 2009. He was knighted in the 2006 Queen's Birthday Honours.

Welcome Address

John Neilson

Imperial College London

John Neilson is Secretary & Registrar of Imperial College London. He is a member of the College's Council and Management Board, and he has specific responsibilities for governance, the registry, outreach activities, risk management, health & safety and internal audit and for developing links with Government and funding bodies.

After reading mathematics at Cambridge, John Neilson joined the Department of Energy where he worked on several privatisations, including gas and electricity. In the late 1980s, he worked in the Economic Secretariat of the Cabinet Office, before becoming Principal Private Secretary to John Wakeham when he was Energy Secretary. In the 1990s, he led the Department of Trade and Industry teams advising on telecommunications and then aerospace and defence, before becoming an executive board member of the gas and electricity regulator Ofgem. From 2005 until 2011, he was Director, Research Base in the Department for Business Innovation & Skills and its predecessors, where he advised on the £6 billion spent annually on public research in universities and institutes. He sat on five Research Councils. His final civil service post before joining Imperial College was as Director of Financial Management in the Ministry of Defence, which included his being a non-executive director of the Defence Science and Technology Laboratory and the Met Office.

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.

Friday 17th August

Professor Richard O'Kennedy
Dip. F.S. B.Sc. Ph.D. C. Biol.
FSB. F. I. Biol. I.

New Developments in Exploiting Antibodies for the Detection of Cancer and other Diseases

Our immune system is one of the most powerful systems that we possess to combat disease. We can exploit components of this system e.g. antibodies, to develop highly sensitive and specific methods of detecting and treating cardiac disease, cancers, bacterial and viral infections and a host of other pathogens.

To achieve this, requires the input of multidisciplinary teams consisting of biologists, doctors, physicists, chemists, engineers, materials specialists, veterinarians, computing experts, nurses, sociologists, health-care workers and many more. Successful approaches must be clearly patient-focused, be economically practical and provide the necessary outcomes to improve our health. This lecture will give examples showing how this approach is necessary for the improvement of human health and welfare world-wide.

Professor O'Kennedy is Professor of Biological Sciences, School of Biotechnology, Deputy-Director and Principal Investigator, Biomedical Diagnostics Institute and Former Vice-President for Learning Innovation, Dublin City University, as well as LIYSF President. Current research projects include; developments of novel antibody and cell based sensor systems, drug metabolism and mode of action (coumarins and coumarin derivatives), antibody-based assay development, novel antibody labelling systems and genetic methods of antibody production.

Saturday 18th August

Dr. Peter Douglas, BSc PhD CSci CChem FRSC ASIS FRPS
Assisted by Dr. Mike Garley

Chemistry and Light

The aim of the lecture is to show the importance of photochemistry in our world. We will look at how light is made: This serves to demonstrate how light can be generated electrically, thermally and chemically, and how visible light can be generated from ultraviolet light. We will also consider how light is used today in technology and everyday life, this includes its use in photography, electronics, entertainment, plastics, medicine and security. Finally, we will consider how light might be used in the future to solve two of the most important problems facing mankind i.e. the production of clean water and clean energy: The lecture ends with demonstrations illustrating ways in which light can be used to purify polluted water and how sunlight can be used as the ideal non-polluting energy source by conversion into electricity or a chemical fuel.

Dr. Douglas obtained his BSc in Chemistry from Newcastle University, followed by a PhD from University College London for research on solar energy conversion carried out at The Royal Institution under the supervision of Nobel Laureate, George Porter. After a few years in the research laboratories of Kodak Ltd. he joined the staff at Swansea University where he is currently a Senior Lecturer in Chemistry. He is also a fellow of the Royal Society of Chemistry. Dr. Garley recently retired from his position as senior experimental officer in the chemistry department at Swansea University. A physical scientist by training, he was a research assistant with British Steel, then a part-time lecturer in physics at Swansea Institute before joining Swansea University.

Monday 20th August

Dr. Aravind Vijayaraghavan

Unexpected Science in a Pencil Line

In this lecture, Dr. Aravind will introduce graphene, the world's first two dimensional material and the subject of the Nobel Prize winning research led by Professor Geim and Professor Novoselov at The University of Manchester. You will learn about all the superlative properties of graphene, such as its strength, electrical/thermal conductivity, transparency, stretchability, etc. You will also learn how graphene can be made, even by you, using just a piece of graphite (found in pencil lead) and a roll of Cello-tape. Dr. Aravind will show you what graphene looks like under a transmission electron microscope at over 1,000,000 times magnification. Finally, turning to the future prospects for graphene, including the many exciting applications of graphene such as bendable electronic devices and super-fast computer chips.

Dr. Aravind Vijayaraghavan is currently a lecturer at The University of Manchester. He obtained MS (2002) and PhD (2005) degrees in Materials Science and Engineering from Rensselaer Polytechnic Institute (USA) and a B.Tech (2000) in Metallurgical Engineering from Indian Institute of Technology - Madras (India). He has then held post-doctoral positions at Karlsruhe Institute of Technology (Germany) as an Alexander von Humboldt Fellow from 2006 - 2009 and at Massachusetts Institute of Technology (USA) from 2009 - 2010. His research interests include graphene, carbon nanotubes and molecular electronics. He has published 32 papers in international peer-reviewed journals.

Tuesday 21st August

Professor Steve Cowley

Fusion - Powering the Future?

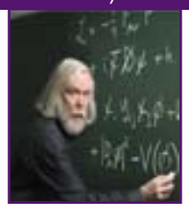
With fossil fuel reserves dwindling and environmental concerns over the emission of greenhouse gases, the search for alternative energy sources is becoming a prominent social issue.

A world-wide research programme is studying the viability of nuclear fusion - the process that powers the Sun - as a future energy source. The world's largest magnetic confinement fusion experiment and European flagship facility, the JET device, has been operating at the Culham Science Centre in Oxfordshire for twenty five years and has successfully demonstrated the fusion of Deuterium and Tritium ions, producing some 16MW of fusion energy. Whilst challenges remain to be overcome, fusion power offers the potential of almost limitless electricity with no greenhouse gas emission and short lived radio-activity compared to fission.

Professor Steve Cowley became the Director of the UK's fusion research programme at Culham Science Centre in September 2008. Having received his BA in Physics from Oxford University and his Ph.D. from Princeton University, Steve has worked on fusion research at Imperial College, London, Princeton, Culham and UCLA. He is a Fellow of the American Physical Society and the Institute of Physics.

11 Principal Lectures and Demonstrations

Tuesday 21st August



Professor John Ellis

To Higgs or not to Higgs?
That is one of the questions

Professor Ellis will discuss whether experiments at the Large Hadron Collider (LHC) at CERN are revealing the existence - or otherwise - of the mythical Higgs boson, the hypothesized last building-block of the Standard Model of particle physics. He will also discuss the prospects for answering other questions, such as the origin of the matter in the Universe and the nature of dark matter.

John Ellis is the Clerk Maxwell Professor of Theoretical Physics at King's College London, having previously been a senior staff scientist at CERN, the European laboratory for particle physics, where he continues as Guest Professor. John's research is concerned with the fundamental building blocks of matter, the elementary particles and the forces between them. He played a key role in establishing the Standard Model of particle physics, for example by suggesting how the gluon could be discovered and predicting the mass of the top quark. He has also been a pioneer of research at the interface between particle physics and cosmology, notably through his work on the origin of matter and the nature of dark matter.

Thursday 23rd August

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. We will concentrate on the latter, but not before a brief consideration of harmful effects of solar radiation. Therapeutic uses include treatment of skin complaints such as psoriasis, treatment of neo natal jaundice and photo-inactivation of viral, bacterial and fungal infections. The laser has revolutionised some aspects of medicine and laser applications discussed will include laser surgery using infrared and ultraviolet lasers and the use of lasers plus chemical sensitisers to destroy tumours selectively (photodynamic therapy). The topic is illustrated with many demonstrations, and gives an overview of the subject from the point of view of a chemist.

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 in the University of Texas at Austin, 1964-6, (Fulbright Scholar), and the Institute of Chemical Physics, Academy of Sciences of USSR, Moscow 1966/7, before beginning his University teaching and research career at the University of Southampton, Department of Chemistry in 1967. He then moved to London in 1980 as Wolfson Professor of Natural Philosophy at the Royal Institution and in 1989 became Hofmann Professor of Chemistry at Imperial College London, 1989-2006, Head of Department 1992-2002. He served as Dean for the Faculties of Life Sciences and Physical Sciences, 2002-2005, and Senior Dean, 2005/6 at Imperial. He is author of some 590 articles and reviews in his field of photochemistry and received the Porter Medal of the European, Oceanic, and Inter-American Photochemistry Associations 2010 for this work. He is a committed populariser of science; and was awarded the Michael Faraday Award of the Royal Society in 1997, was awarded an OBE in 1999 for services to science education, and CBE in the 2011/12 New Year's honours list for services to Chemistry. He is currently President of the Royal Society of Chemistry.

Saturday 25th 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.

Saturday 25th August

Dr. Cyril Isenberg Bsc PhD IIP

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 27th August

Professor Sam Evans

The Strange Mechanical Behaviour of Skin

Skin is a material that is literally all around us and its mechanical behaviour is very important in the design of things like razors or car seats, in medical devices and measurements and in applications such as animation and surgical simulation and planning. It has very unusual mechanical properties, being extremely flexible and easy to stretch, but tougher than high strength steel. Surprisingly, its mechanical behaviour is not at all well understood and it is very difficult to measure or model because it is completely different from conventional engineering materials. This requires new kinds of experiments, complex computational models and new techniques to link them together.

Sam Evans is a Professor at the School of Engineering in Cardiff University. His main area of research is the mechanical behaviour of materials, including experimental testing and mathematical and computational modelling. Applications include prediction of failure in aircraft components and medical devices, the development of new materials for hip and knee replacements and the mechanics of skin and other soft tissues.

Wednesday 29th 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 find new and improved medicines and to counter the development of bacterial, viral and protozoal resistance, there exist a number of other infectious diseases such as River Blindness, 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 even then, access to both new and to existing medicines remains a major problem.

Many countries lack the basic financial capacity to provide adequate healthcare and the people in greatest need usually do not have the means to pay for what limited resources/medicines are available. In addition, factors such as the logistics of delivery, counterfeiting, corruption, taxes and trade practices confound the subject.

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 the USA and Europe. He is a visiting Professor at King's College, London and holds honorary degrees and Gold Medals from six 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 CBE in 2003.

Monday 27th August

Professor Keith Martin MA BM BCh DM MRCP FRCOphth

Vision for the Future

Our understanding of the human eye has increased enormously over the last hundred years, yet numerous diseases retain the ability to deprive us of our most vital sense. Sadly, many people today remain blind with conditions such as cataracts that are easily, quickly and completely treatable with access to appropriate healthcare. For other conditions, however, we have no effective cure. When the optic nerve is damaged by trauma or severe glaucoma, the vital cells that connect the eye to the brain die.

In this lecture, we will look at new technologies being used to restore vision in previously hopeless situations. Recent successes in ocular gene therapy will be discussed and we will also consider the use of stem cells to treat eye diseases.

So join us to see why the future might just be brighter for those who have lost their sight.

Keith Martin graduated from the University of Cambridge with First Class honours in Medical Sciences and Neurobiology in 1990 and Oxford University Clinical School in 1993. He undertook Research and Clinical Fellowship Training in glaucoma at the Wilmer Eye Institute, Johns Hopkins University, Baltimore, USA and at the Institute of Ophthalmology in London before returning to Cambridge in 2005.

He has won several international awards for his work including the ARVO Translational Research Award 2010 and a Senior Investigator Award from the World Glaucoma Association in 2011. He was appointed as the first ever Professor of Ophthalmology at the University of Cambridge in 2010.

21st August Specialist Lectures

10.00hrs - Sir Alexander Fleming Building

Lecture **21A**

Dr. Arvin Antipolo

The Role of Glutathione in our Eye

Glutathione plays a significant role in the protection of the eyes from oxidative stress, which leads to unclear eyesight and eventually blindness. When faced with a lack of glutathione in the eyes, there is a greater chance of Open-Angle Glaucoma, Macular Degeneration and Cataracts. The eyes create glutathione to protect against the oxidation that the sunlight produces. Disturbances of the oxidative state cause toxic effects to the DNA. Glutathione is the guardian of the cell. Glutathione neutralizes free radicals better than anything and is the best thing you can have to support the function and structure of your body in every cell. Glutathione is a reducing compound that normally exists in an unusually high concentration in the lens where it functions as an accentual antioxidant and is vital for maintenance of the tissues transparency. The depletion of glutathione or the inhibition of the cycle to occur causes oxidative damage resulting in a clouding of the lens.

Arvin attended LIYSF in 1995, then graduated from University of Santo Tomas in biochemistry. He then continued his studies becoming a doctor of medicine and surgery. In 2004, he was awarded first Place in Philippine Academy of Ophthalmology annual research contest and in 2005 first Place in Philippine Academy of Ophthalmology - Singapore Eye Research Institute research presentation. He was the chief resident at the Department of Ophthalmology, University of Santo Tomas and has been awarded fellowships from the Jules Stein Eye Institute, UCLA. He is currently Ophthalmology Consultant at UST Eye Center, Unihealth-Baypointe Hospital and James L. Gordon Memorial Hospital. He has also been recently awarded as one of the 400 distinguished Thomasians of the University of Santo Tomas (UST).

Lecture **21B**

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 Ph.D. 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 **21C**

Dr. 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 she was a teenager and was fortunate enough to be able to build her career around these topics. After a degree in Physics at the University of Milano, Italy, and a PhD. in x-ray Astronomy at University College London (UCL), Graziella spent two years doing research at Harvard University, in Boston, USA, then she returned to the UK and has been a member of staff at the UCL Mullard Space Science Laboratory (MSSL) ever since. Graziella's main interest is x-ray astronomy, involving both observations and instrument development; she has studied many different types of astronomical x-ray sources and most recently active galaxies and planets in our own solar system.

Lecture **21D**

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 itself as a real alternative to fossil fuel energy. However, the industry will face a tough future ahead of it. Promoters of this energy source must therefore 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? This seminar will examine these questions and why Hydrogen is an attractive energy alternative.

Maurice Brown was born and raised in Kingston Jamaica where he completed most of his formal education 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 subsequently completed a Masters degree in Business Management. He was interested in sciences from a very early age, with a fascination for aviation and space exploration. While in High School, his career ambitions focused on becoming a Dentist. However, his love of aviation continued and he took a more business approach to his education and later became a consultant to the aviation industry and later, holding financial roles and positions in various International companies. Currently, he is lecturer in Finance and Business Strategy at the University of Applied Sciences in Utrecht, The Netherlands and is owner of a small company looking into promoting and exporting to developing countries, which support a sustainable future for our planet.

21st August Specialist Lectures

10.00hrs - Sir Alexander Fleming Building

Lecture **21E**

Professor Ivan Dementiev

Mendeleev's Periodic Law in the Light of Synergetic Information Theory

Students will be given an overview of the fundamental unity of the processes in information systems and systems of atoms. The lecture will focus on the problem of using the fundamentals of synergetic information theory with a wide range of scientific disciplines. We consider the concept of entropy and negentropy, as well as their relationship. We will show the synthesis of the periodic law of Mendeleev and explain the basic properties of matter from the standpoint of synergetic information theory. The lecture allows you to see the fundamental laws of nature and to look at the underlying processes from the perspective of information theory.

Ivan was born in Moscow in 1984. After he finished University of Radio Engineering, Electronics and Automatics in 2007, he started to work as an associate professor and leading engineer. He received a Phd in computer science in 2009. He is currently Deputy Director of Moscow State Center of Informational Technologies and Associate Dean of Mention University. Ivan is also the leading researcher in the System Modeling and Synergetic Informational Theory.

Lecture **21F**

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 such as nausea, vomiting, drowsiness and in extreme cases hallucinations.

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. After graduation, he worked briefly for a Cambridge based biotechnology company. In early 2008, he joined Prof. Wood's lab, based at University College London, working as a laboratory technician. In 2009, he joined the London Pain Consortium as a PhD student and has subsequently worked on projects at University College London and the University of Oxford. He is currently in the second year of his PhD, which is exploring the role of SCN9a in nociception and pain.

Lecture **21G**

Jon Taylor

Saving Elephants for the Facebook Generation

Approaches to the conservation of our natural world are always evolving and never more so than at present, as humanity's footprint becomes so great that global systems like the climate are affected. This talk will begin by exploring briefly the history of nature conservation, to provide a context for exploring in greater depth the current paradigm in which conservationists are operating and the challenges that must be met if our interdependence with our world is to be properly understood, valued and protected. Wild elephants, planetary boundaries and Facebook; this talk will explore new approaches in these rapidly changing and critical times for nature conservation.

Jon Taylor is the Climate Change Programme Manager at WWF-UK, where he leads on climate science and international development projects. Jon trained as an ecologist and has an MSc in Biological Computation and an MA in Environment, Policy & Society. Before joining WWF, Jon spent 16 years working on conservation and development projects in Africa and Asia, as well as in the EU. At various times, he has also been a school teacher and a lion keeper.

23rd August Specialist Study Day
The Human Planet - Overcoming Disaster
10.00hrs - Sir Alexander Fleming Building

Participants will work in their topic groups with their seminar leader to discuss their topic in relation to the theme and prepare a plenary report to present at the end of the day. This day will be moderated by Sir Colin Terry.

Lecture **23A**

Sir Colin Terry KBE CB BSc (Eng) EEng FREng FRSA FILog FCGI FRAeS

Mechanical Engineering

This seminar study will focus on the current issues within the field of Mechanical Engineering.

Sir Colin has had a long career in the Royal Air Force, attaining the rank of Air Marshal and Chief Engineer (RAF), Head of Logistics and Commander in Chief of Logistics Command and was responsible for 15,000 personnel and 30 aircraft types.

Sir Colin is currently President of his College Association and member of the Courts of Cranfield and Imperial College London, latterly where he obtained an Honours Degree in aeronautical engineering. Sir Colin Terry is the President of the Council of the Royal Aeronautical Society, Chairman of the Engineering Council and is a member of the Engineering Technology Board (ETB). Since July 2004, he has been chairman of Meggit plc and as a Chartered Engineer, advises several international aerospace companies.

Lecture **23B**

Dr. Jean-Pierre Guignard

Earth Observation from Space

The topic of monitoring/overcoming disasters using Earth observation techniques has been the subject of intensive work within ESA and CNES, both space agencies being at the origin of the International Charter for Space and Major Disasters (involving today most of the world's largest space agencies). The Charter is operational and has been activated all over the world, some 400 times over the last 10 years and for a variety of major risks including floodings, forest fires, landslides, tsunamis, volcanic eruptions, earthquakes.

Dr. Jean-Pierre Guignard, is an acknowledged expert in the field of Earth Observation (former member of the ESA ERS and ENVISAT project teams, SAR applications expert). Dr. Guingnard has been recruited by the Science University of Paris in Orsay and Central University of Venezuela in Caracas. He joined the European Space Agency where he was involved with the development of the first European Satellite for Earth Observation (ERS-1 the ERS-2) carrying a SAR on board and later SAR applications - feature extractions, ship detection, land classification, forest monitoring and fire burning mapping. He was the head of the Ground Segment Development Division at ESRIN (Italy), launching ERS-2, the biggest Earth Observation satellite ever launched. Now retired, Dr. Guinard works with GeoVirtual on a European alternative to Google Earth.

Lecture **23C**

Dr. Ricardo Costa

Emergency Blood Supply

One of the most decisive problems caused by a catastrophic event with human victims is the limited supply of blood components for transfusion, caused by their limited shelf-life and the practical impossibility of storing some components long enough for use in times of need.

We will discuss several ways in which blood components can be procured, collected, studied, stored and transfused, highlighting the possibilities that exist to multiply the donations and the available components during times of greater demand. We shall also mention new trends in the investigation of oxygen-transporting molecules and blood-like products that can be safely stored and hastily obtained.

Dr. Costa was born in Portugal, qualified as a doctor and later qualified as a haematology specialist, master in cellular biology and transfusion medicine specialist. In the late 1990s he was the Director of the Blood Bank, Leira and then the Clinical Director of the Leiria Hospital. More recently, Dr. Costa has worked further in the field of competency in emergency medicine and trained to work in medical rescue helicopters. Dr. Costa currenly works as a haematologist in the Oncology Unit at Hospital do Barreiro, Portugal.

Lecture **23D**

Professor Keith Goulding

The Role of Soil in Sustainable Food and Farming

As much as 90% of all food is grown in soil, so healthy soils are the basis for global security in food and nutrition. However, fertile soil irregularly covers only 11% of the land surface and is, effectively, a non-renewable asset. It can be readily degraded but is extremely slow to restore: one study has found that, in Australia, soil is being lost 5 times faster, in the US 10 times faster, in Europe 17 times faster, and in China, 57 times faster than it is being created. Soil must be well managed and protected.

Professor Goulding is Scientific Director of Delivering Sustainable Systems Programme at Rothamsted Research Centre. Keith joined Rothamsted in 1974 after completing an MSc in Soil Chemistry at Reading University and gained his PhD at Imperial College in 1980. His research has included the supply to crops of potassium and phosphorus from the soil, acid rain, soil acidification and liming. His current focus is on carbon and nutrient cycling, especially losses of nitrogen from farmland to air and water and their environmental impact.

23rd August Specialist Study Day
The Human Planet - Overcoming Disaster

10.00hrs - Sir Alexander Fleming Building

Participants will work in their topic groups with their seminar leader to discuss their topic in relation to the theme and prepare a plenary report to present at the end of the day. This day will be moderated by Sir Colin Terry.

Lecture **23E**

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 session will consider crossing the planetary boundaries and introduce some of the impacts of crossing these boundaries for food security. This lecture 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 and 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.

Lecture **23F**

Dr. Ed Llewellin

Understanding Volcanoes

Around half a billion people live close enough to an active volcano to be acutely at risk if it erupts. The nature and severity of the hazard faced depends critically on the style of the eruption. For example, whilst the violently explosive eruption of Krakatoa in 1883 killed 36,000 people, the much gentler eruption of Eyjafjallajökull in 2010 killed no one, but caused economic disruption costing more than a billion pounds. In this theme, we will consider the physical processes that drive and shape volcanic eruptions, control their impacts and, ultimately, inform the management of volcanic hazards.

Dr. Ed Llewellin is a senior lecturer in Volcanology at Durham University and was a participant in LIYSF 1992. After reading Natural Sciences at Cambridge University, Ed undertook his doctoral research in Physical Volcanology at Bristol University. His research combines laboratory experiments, numerical modelling and fieldwork to understand how and why volcanoes erupt.

27th August Specialist Lectures

10.00hrs - Sir Alexander Fleming Building

Lecture **27A**

Dr. Robert Adam

Drugs, Dopamine and Impulsivity

Ever since humans first evolved, they have sought pleasure or escape through the use of psychoactive substances. It seems that the neurotransmitter, dopamine, plays a vital role forming a common pathway in the neural circuitry for addiction. In this seminar, we will explore the many varied roles of dopamine so far known in the human brain - including the role of dopamine in conditions such as Parkinson's disease and Schizophrenia. Finally, we will introduce the field of neuro-economics where it seems that dopamine may have a pivotal role in how we make decisions in both health and disease.

Dr. Adam is a Specialist Registrar in Neurology, Queen's Hospital, Barking & Havering University Hospitals NHS Trust. He studied neuroscience as an undergraduate at Cambridge looking in particular at the effects of caffeine on the frontal lobes. He completed his medical training at University College London and has held various clinical posts both in the UK and at New York University Medical Center, USA. His recent work as a research fellow at the Institute of Neurology, UCL, Queen's Square, used eye movements to investigate impulsive behaviours in various neuropsychiatric conditions and the effects of dopaminergic drugs on healthy volunteers.

Lecture **27B**

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.

27th August Specialist Lectures

10.00hrs - Sir Alexander Fleming Building

Lecture **27C**

Judith O'Toole BVSc MRCVS, HdipEd

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) 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 **27D**

Sam Meyler

Creativity: the Playground of the Brain

Where do creative ideas come from? What are the mechanisms for creativity, and what measures exist to study such a concept? What examples of creativity can we see in non-human animals? Is creativity a pre-requisite for good science?

This lecture will give an introduction on the topic, discussing the literature and attempting to approach this elusive subject both from an artistic and scientific point of view. We will then discuss some of the work we have been developing with dancers and actors. Can we prime a "creative cognitive state"?

Sam Meyler is both an artist and a scientist. He originally studied conservation biology and worked on population estimates on mammals, more specifically asendangered cetaceans and lemurs in Africa. He is also a performer and teaches physical movement and mask work in various centres in Europe. He currently works in the Neuroscience department at the Champalimaud Centre for the Unknown, in Lisbon Portugal.

Lecture **27E**

Salomé Pereira de Matos

What Are We Made Of?

Stars live for millions of years, yet it is a mystery how humans, who live 100 years, are able to study these intriguing objects. We live in a world surrounded by materials, composed of the various elements of the period table. But where did these elements come from and how did they form? The answer lies in the extreme conditions under which stars live and die, where Chemistry and Physics are taken to its limits. Join us on this journey through the life and fantastic death of stars.

Salomé was born in Vila Franca de Xira, Portugal. Having completed secondary education at Instituto Infante D. Afonso. She then entered Lisbon University where she finished her B.Sc. Physics - Astronomy & Astrophysics. Salomé is currently a PhD student at the University of Edinburgh where she is studying the star formation history of the Universe.

Lecture **27F**

Dr. Maria-Nefeli Tsaloglou

Bio-Developments in the Ocean: Use of Microfluidic Sensors for the Detection of Nucleic Acids in the Ocean

Oceans, together with the atmosphere, form a tightly linked system which influences global climate conditions. Phytoplankton or algae are abundant photosynthetic primary producers at the base of the marine food web in the oceans. Certain types of marine algae can cause harmful algal blooms (HABs) which poison local ecosystems and can lead to major financial losses for fishery, tourism and healthcare industries. In 2005, the total cost in the European Union was estimated at €584 million. As climatic change is affecting global ocean circulation, HABs are becoming increasingly frequent.

Monitoring of HABs necessitates in situ sensors with high temporal and spatial resolution, reliability and accuracy that can withstand long-term deployment. Modern nucleic acid analysis tools combined with microfluidic technology can provide a cost-effective, robust and efficient alternative to current labour intensive identification techniques using microscopy.

Greek-born Nefeli studied in Marouda School of Athens, Lycée Léonin de Patissia and Athens American College, later studying Biochemistry and chemistry at the School of Biological Sciences of the University of Southampton. Her chemistry undergraduate project on Electron spin resonance spectroscopy of liquid crystal gels with enhanced properties and their applications in display devices, supervised by Prof. G. R. Luckhurst, was awarded the 2003 Alan Carrington Prize for best undergraduate research project in physical chemistry. In June 2008, she completed her PhD on lipid regulation of enzyme function with Prof. George Attard and then continued for a short post doc on the effect of liposomes on DNA transcription. She joined the Sensors Development Group in December 2008 on the LabonFoil project.

27th August Specialist Lectures

10.00hrs - Sir Alexander Fleming Building

Lecture **27G**

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).

28th August Specialist Study Day
Managing the Warming World

10.00hrs - Sir Alexander Fleming Building

Participants will work in their topic groups to prepare a plenary report. This day will be moderated by Professor Roland Clift, Emeritus Professor of Environmental Technology and founding Director of the Centre for Environmental Strategy at the University of Surrey; previously a Visiting Professor at Chalmers University; Adjunct Professor at the University of British Columbia; a past member of the Royal Commission on Environmental Pollution and Defra; and a Vice President of Environmental Protection UK.

Lecture **28A**

Professor Matthew Leach

Using the Ocean to Clean up the Climate

The talk will outline the long term challenge for every country 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.

Professor Matthew Leach is Director of the Centre for Environmental Strategy at the University of Surrey. A chartered engineer, Matthew holds a bachelors in Mechanical Engineering from the University of Southampton, an MSc in Environmental Technology from Imperial College London and a PhD focussed on Energy Efficiency Policy. Matthew is past Chair of Council of the British Institute of Energy Economics and Vice President of the Energy Institute.

Lecture **28B**

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.

28th August Specialist Study Day
Managing the Warming World
10.00hrs - Sir Alexander Fleming Building

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Lecture **28C**

Richard Peagam

Material Recovery, Re-Use and Recycling

Projections are that between 2000 and 2050 the world population will grow by 50%, global economic activity will grow by 500% and global energy and materials use will grow by 300%. Unless economic growth can be dramatically decoupled from resource use and waste generation, environmental pressures will increase rapidly (US EPA 2009). It is essential to manage these resources, or materials, and the waste they produce sustainably to reduce environmental pressures and to mitigate the problems caused by their dwindling availability. The group will consider the whole lifecycle of materials, to determine environmental pressures from extraction through production to end-of-life. The group will then discuss ways to reduce these environmental pressures and to recover traditionally wasted materials to make the whole lifecycle of resources more sustainable.

In 2008, Richard began working for the Environment Business Management Organisation of the technology company, Hewlett Packard. He started on the PhD programme at the University of Surrey in April 2009, specialising in e-waste and resource recovery as a student sponsored by HP. Richard also manages HP's ongoing research with an EU consortium and other projects.

Lecture **28D**

Dr. Vanesa Magar

Impacts of Sea Level Rise and Increased Storminess Coast Management and Defence

"How come the 1 in 50 year event has already flooded my house two years in succession?" Explaining the nature of the risk of flooding to those protected by flood defences is one of the major challenges faced by coastal engineering today. Indeed, those designing, commissioning and constructing defences and those insuring assets in the areas protected by flood defences all need to have a good understanding of the link between a particular structure and the risk associated with it. The philosophy behind sea defence design has changed appreciably since the 1953 North Sea storm flooding that claimed the lives of more than 2000 people. Students will consider the probabilistic nature of coastal defence and the impact of climate change on coastal flooding and aserosion. Students will also consider possible mitigation measures and on coastal defences, including soft engineering approaches and holistic management strategies.

Dr. Vanesa Magar is a lecturer in Coastal Engineering at the School of Marine Science and Engineering at the University of Plymouth, UK. Her research interests focus on fluid dynamics (geophysical and biological), coastal and ocean transport processes, morphodynamics and long term coastal management and defence. She has taught hydrodynamics, coastal processes, mathematics and computing to oceanographers, coastal scientists and engineers.

Lecture **28E**

Dr. Alex Penn

Permaculture: Designing Human Ecosystems

Permaculture is a systems-level approach to the design of sustainable communities, organisations and agricultural systems, based on applying principles from evolutionary and ecological dynamics in order to design low-maintenance, robust and resilient organisations. Community participation and the combination of ecological, economic and social sustainability are key to this approach. We will discuss its connections to new thinking in complexity and evolutionary sciences and illustrate with a broad range of applications from designing community gardens to controlling bacterial communities and to new fields of biological technology.

Dr Alex Penn works on evolutionary theory and complexity science and their potential contributions to sustainability. As well as basic science, she works on the ground applying new science to solving practical problems, from the transition of industrial networks to a low carbon economy, to the regeneration of soil ecosystems in degraded land. She has a PhD in Life Sciences from the University of Sussex, has held a Fellowship at the Collegium Budapest Institute for Advanced Study and is currently a Research Fellow on the Evolution and Resilience of Industrial Ecosystems project at the University of Surrey. Outside her academic work, she has been teaching and practising permaculture for many years.

Lecture **28F**

Julia Tomei

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 favor, the possible negative social and environmental implications obscure these positive possibilities. The potential regions which have the resources to produce sufficiently large amounts of biomass for energy to impact on EU fossil energy demand are Asia, Africa and South America. An integrated production considering better land use for producing food, fibre, fodder and fuel (FFFF) needs to be incorporated.

Julia Tomei is a PhD student at the UCL Energy Institute, University College London. Her research focuses on biofuels, specifically how global biofuels policy is translated into local outcomes, using the European Union and Guatemala as case studies. Julia holds a BSc in Biology from the University of Leeds and an MSc in Environmental Technology from Imperial College London.

Specialist Study Day

28th August Specialist Study Day
Managing the Warming World
10.00hrs - Sir Alexander Fleming Building

Lecture **28G**

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.

26th August Debate Evening

Debate Evening

Dr Heleen van de Weerd and
Emily Lewis Brown

The Global Food System: Good for People, Good for Animals?

Hungry for debate about food? Join this session for a lively discussion about the global food system: is it fit for 1billion hungry people and the 70 billion animals farmed each year and can the earth cope?

Dr Heleen van de Weerd is a biologist who specialised in animal behaviour with the aim to improve the lives of animals in captivity. Her work has focussed on applied research and consultancy on the welfare of farm animals. In 2011, Heleen joined Compassion in World Farming as Director of Research.

Emily Lewis-Brown is an environmental advisor and researcher, focussing on conservation and climate change. Having worked primarily on environmental research and policy, she joined Compassion in World Farming in 2011 as Research Manager.

Social Programme and Optional Visits

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

Friday 17th August
20.30hrs Welcome Party at Metric, Imperial College Student Union

Saturday 18th August
20.00hrs Science Forum Bazaar in Sir Alexander Fleming Building Foyer

Sunday 19th August
20.00hrs Student Topics in LT G16, Sir Alexander Fleming Building, Imperial College

Monday 20th August
20.00hrs The Great Crossword Treasure Hunt, Imperial College - South Kensington Campus and surrounding areas

Friday 24th August
20.00hrs International Cabaret at Metric, Imperial College Student Union

Sunday 26th August
19.00hrs Student Debate Evening
20.30hrs Songs of Home at Union Concert Hall, Imperial College Student Union

Wednesday 29th August
20.30hrs Farewell Party at Metric, Imperial College Student Union

LIYSF offers a varied programme of optional visits. On Friday 17th August at 17.00hrs tickets will be on sale from LIYSF staff after the plenary lecture demonstration. Please see website for full details.

Saturday 18th August
13.00hrs LIYSF Olympic Tour
13.00hrs Optional Sightseeing Tour of London

Sunday 19th August
09.00hrs Optional Excursion to Stonehenge and Salisbury

Wednesday 22nd August
19.30hrs Optional Theatre Visits
19.30hrs London Eye Night Experience

Sunday 26th August
09.00hrs Optional Excursion to Hampton Court Palace and Windsor Castle

Tuesday 28th August
19.30hrs Optional Theatre Visits
19.30hrs London Eye Night Experience

MONDAY 20th AUGUST LONDON VISITS

20/01 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.

20/02 Imperial College London, Earth Science and Engineering Department

Research and teaching at one of the world's leading centres for the study of Earth science (geoscience).

20/03 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, Molecular Biosciences; Cell & Molecular Biology and Ecology & Evolution.

20/04 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.

20/05 The Jodrell Laboratory at the Royal Botanic Gardens, Kew

World-famous centre for botanical research and study; includes a visit to the Jodrell Laboratory.

20/06 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.

20/07 The Old Operating Theatre and Herb Garret

Original Operating Theatre dating from 1821, with original instruments; find out about surgery before anaesthesia and antiseptics.

20/08 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.

20/09 University College London, Wolfson Institute for Biomedical Research

The molecular nociception group has been using genetic approaches to examine the biology of damage-sensing neurons, somatosensation and pain.

20/10 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.

20/11 The Zoological Society of London, Veterinary

Caring for the health of the animals in London Zoo; and research into the welfare and conservation of free living animals.

20/12 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.

WEDNESDAY 22nd AUGUST DAY VISITS

22/01 Airbus UK

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

22/02 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.

22/03 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.

22/04 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 I era piston engines, the famous Merlin, right up to modern day jet engines.

22/05 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.

22/06 Syngenta's International Research Centre at Jealott's Hill

Syngenta's base for research into discovery of new active ingredients, new formulation technologies. The site has centres of excellence such as analytical science, protein science and bioscience.

22/07 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.

22/08 University College London, Mullard Space 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.

22/09 University of Kent, Electronics Laboratory

Design and research in electronics and digital multimedia equipment.

22/10 University of Warwick, Electrochemistry & Interfaces/ Electron Microscopy Department

The application of electrochemistry to the understanding of fundamental and industrially significant interfacial chemical processes at the micro to nanoscale.

FRIDAY 24th AUGUST OXFORD/CAMBRIDGE VISITS

24/C/01 EMBL - European Bioinformatics Institute

Research institute that works to provide freely available data and bioinformatics services to all facets of the scientific community in ways that promote scientific progress.

24/C/02 University of Cambridge - Earth Sciences Department

From geophysics and applied mathematics, geochemistry and sedimentology, petrology and volcanism, palaeontology and evolutionary biology, to the physics and fundamental properties of materials.

24/C/03 The Wellcome Trust Sanger Institute

A leader in the Human Genome Project, this institute is focused on understanding the role of genetics in health and disease with research into connection between genetics and infectious disease.

24/O/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.

24/O/02 Museum of the History of Science - Oxford

The Museum of the History of Science houses an unrivalled collection of historic scientific instruments in the world's oldest surviving purpose-built museum building.

24/O/03 University of Oxford, Botanic Garden and the Museum of Natural History

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.

24/O/04 University of Oxford, Nuffield Department of Clinical Neurosciences & NIHR Biomedical Research Centre

NIHR drives progress on innovation and translational research in biomedicine into NHS practice and clinical research working to improve the understanding of the nervous system in health and disease.

24/O/05 University of Oxford, The Department of Plant Sciences

The department is one of the leading UK university departments dedicated to research and teaching in plant biology.

24/O/06 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.

MONDAY 27th AUGUST MUSEUM VISITS

27/NHM 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.

27/SM 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.

Natural History Museum

Science Museum

LIYSF Partners

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Southside Halls of Residence

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Italy

Counsellor
Steven Gillen
USA

Counsellor
Nada ElMansy
Egypt

Counsellor
Tony Le
Australia

Counsellor
Antonis Stylianou
Cyprus

HALLS OF RESIDENCE

Imperial College London
Southside Halls of Residence
Princes Gardens

Hall Host – Sean O'Callaghan

Imperial College London
Beit Halls of Residence
Prince Consort Road

Hall Host – Tom Gilbertson

PROGRAMME VENUES

Royal College of Music
Prince Consort Road

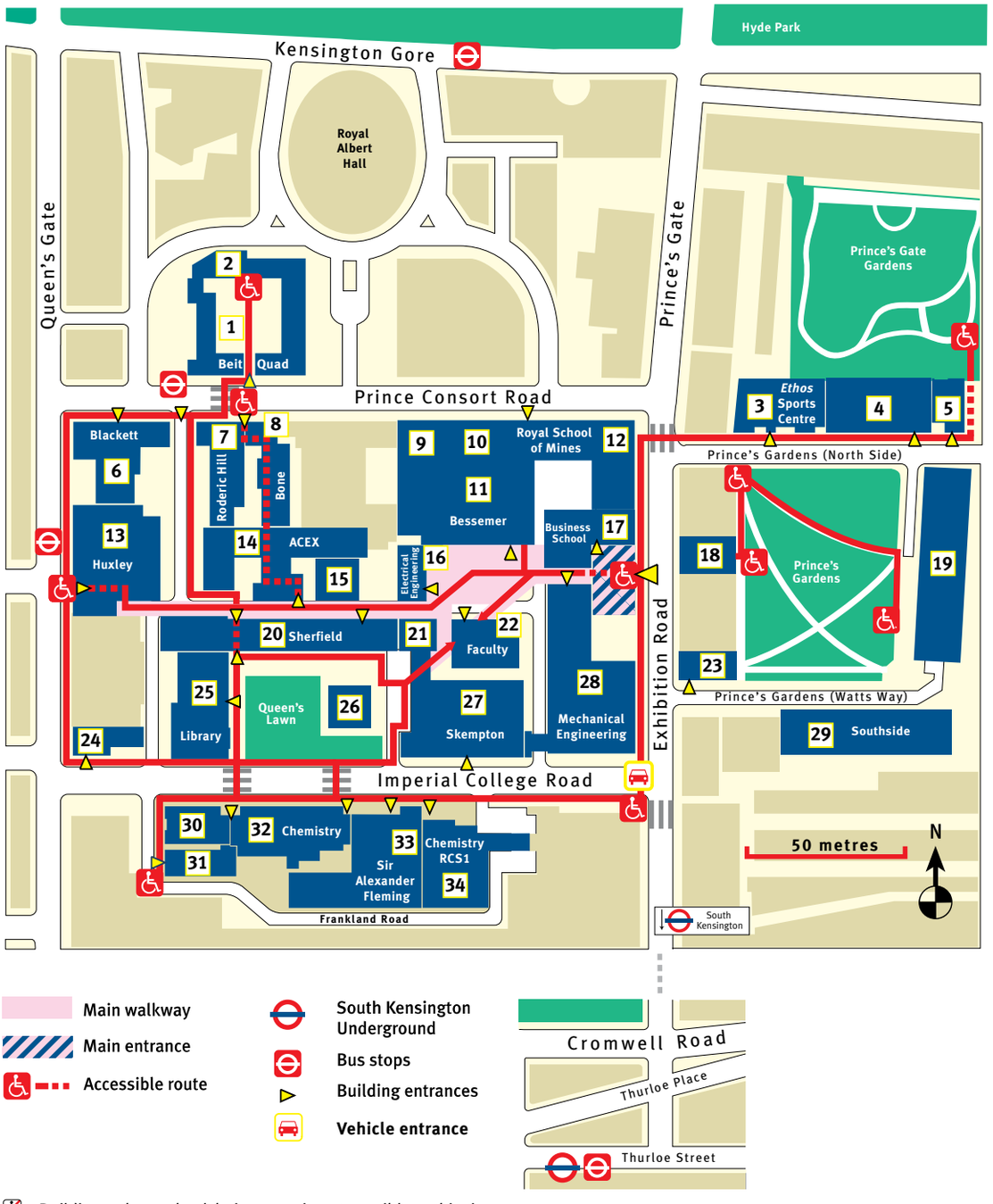
Imperial College London
Sir Alexander Fleming Building

Imperial College London

Imperial College London
Student Union

Imperial College London

South Kensington Campus



Main walkway
Main entrance
Accessible route
South Kensington Underground
Bus stops
Building entrances
Vehicle entrance

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