

Imperial College
London

PROGRAMME

CHEMISTRY
FUTURES
2040

12 April 2019
9:30 – 16:45

PROGRAMME TIMES

Welcome to Chemistry Futures 2040. The morning until 11.20 will mark the official opening of the Molecular Sciences Research Hub (MSRH).

We are delighted that you can join us to celebrate this special occasion.

9:30	Arrival, registration and refreshments MSRH common room		14:00	Industry streams MSRH <i>Choose from one of our specialist industry streams:</i>
10:00	Welcome remarks Professor Alice Gast and Dame Mary Archer		Disruptive Technologies Lecture theatre	Panel: Innovation and chemistry Professor Oscar Ces, Henrik Hagemann (CustoMem), Helene Steiner (Open Cell), Steven O'Connell, (RebelBio), Dr Beena Rai, (TCS). Facilitated by Joe Palca.
10:20	Chemistry Futures 2040: from past to present Joe Palca		Grand Challenges Seminar room	Futures workshop: Food security and world challenges Vincent Doumeizel (Lloyd's Register), Dr Laura Barter, Dr Rudiger Woscholski. Facilitated by Maria Jeansson.
10:30	The digital molecule Professor Mimi Hii	Disruptive Technologies	Networked Chemistry Seminar room	Futures workshop: The chemistry of healthy ageing Dr Stefan Kirschbaum (Evonik), Dr Marco Di Antonio. Facilitated by Dr Graciela Sainz de la Fuente.
10:55	Material discovery machines Dr Kim Jelfs	Disruptive Technologies		
11:20	Break and refreshments MSRH common room			
11:40	Tackling climate change with sunlight Dr Andreas Kafizas	Grand Challenges	15:15	Keynote and fireside conversation: Life Science technology megatrends shaping our future Darlene Solomon (Agilent Technologies) in conversation with Professor Alan Armstrong.
12:05	Creating life from the smallest molecules Dr Yuval Elani	Networked Chemistry	15:40	Reception MSRH common room Tours of the Imperial College Advanced Hackspace
12:40	Lunch and start-up exhibition Innovation Hub		16:45	Close

CHEMISTRY PAST TO PRESENT

#ChemistryFutures

CHEMISTRY FUTURES 2040

CHEMISTRY FUTURES 2040: FROM PAST TO PRESENT

10:20 – 10:30 Lecture theatre



JOE PALCA

Correspondent at National Public Radio

Joe is an American correspondent for National Public Radio, and specialises in science and invention. Since joining NPR in 1992, Palca has covered a range of science topics — from NASA's Space Shuttle launches to the Neanderthal genome. He is currently focused on the eponymous series, "Joe's Big Idea." Stories in the series explore the minds and motivations of scientists and inventors.

Palca was also the president of the National Association of Science Writers from 1999 to 2000. He currently serves on Society for Science & the Public's board of trustees.

ACADEMIC VISIONS

#ChemistryFutures

ACADEMIC VISIONS

THE DIGITAL MOLECULE

10:30 – 10:55 Lecture theatre

How might the fourth industrial revolution transform the landscape of chemistry in the next 30-50 years?

Professor Mimi Hii will share her vision on the importance of adopting a data-led approach for the future of chemistry research, explaining how the new labs at Imperial's MSRH building are offering a range of robotic and automated analytical systems to the chemistry community.

As new tools are entering the lab, what will the future of chemistry look like?



PROFESSOR MIMI HII

Professor of Catalysis, Department of Chemistry

Mimi Hii is Professor of Catalysis and Director for the Pharmacat Consortium and the newly established Imperial Centre of Excellence in Rapid Online Analysis of Reactions (ROAR). Her research interest is in sustainable catalytic processes that produces high-value chemicals. As the Director of ROAR, she champions the use of automation and advanced analytics in molecular science research. More recently, she secured funding to establish a new EPSRC Centre for Doctoral Training in Next Generation Synthesis & Reaction Technology, to produce a critical mass of postgraduate Researchers equipped to tackle the challenges of the 21st century.

MATERIAL DISCOVERY MACHINES

10:55 – 11:20 Lecture theatre

As robotic and automated labs become more prevalent, we need to better utilise the data behind chemistry processes to fully exploit the fourth industrial revolution. How might computational chemistry change the way we view discovery or create predictions for new materials?

Dr Kim Jelfs will share her research on how new tools are enabling the creation of chemistry discovery machines aided by powerful algorithms.

If these new technologies liberate chemists from their normal lab-based work, what could be the future role of the chemist?



DR KIM JELFS

Senior Lecturer, Department of Chemistry

Kim Jelfs is a Senior Lecturer and Royal Society University Research Fellow and specialises in the use of computer simulations to assist in the discovery of supramolecular materials.

After a PhD modelling the crystal growth of zeolites at UCL, she worked as a post-doc across the experimental groups at the University of Liverpool, before beginning her independent research at Imperial in 2013.

She was awarded a Royal Society of Chemistry Harrison-Meldola Memorial Prize in 2018.

TACKLING CLIMATE CHANGE WITH SUNLIGHT

11:40 – 12:05 Lecture theatre

From energy production to energy efficient buildings to energy storage; cities of the future could be powered differently with the use of chemistry. Using our most available renewable energy source - sunlight – we could make our cities self-sustaining. Dr Andreas Kafizas explains his vision for how sunlight can be used to drive chemical processes, such as water splitting, to produce clean hydrogen fuel.

As chemistry becomes increasingly integral to the development of new materials and clean technologies for solving global challenges such as climate change, how might this change the way we view the discipline?



DR ANDREAS KAFIZAS

Lecturer, Department of Chemistry

Andreas Kafizas is a Lecturer in Climate Change and the Environment at the Grantham Institute, Imperial College London.

His research is focused on developing light-activated coatings that can drive useful chemistry using sunlight. For these coatings to be commercially viable and sustainable, they are produced using low-cost, upscalable methods using primarily earth abundant, non-toxic materials.

ACADEMIC VISIONS

CREATING LIFE FROM THE SMALLEST MOLECULES

12:05 – 12.40 Lecture theatre

Chemical Synthetic Biology is the science of turning chemistry into biology, to build synthetic cells from scratch. In essence, blurring the boundaries between the living and the non-living.

What might be the future potential of this new field? These synthetic cells which mimic biological machines could respond reactively by self-healing, be used to synthesise drugs in response to diseased states, and as new classes of tissue-like materials.

As this discipline continues to grow, how might it impact the way we view chemistry as a networked discipline? How will it be used to drive innovation in healthcare and other industries?



DR YUVAL ELANI

Research Fellow and Group Leader,
Department of Chemistry

Dr Yuval Elani is an EPSRC Fellow whose group work on the bottom-up construction of artificial cells that possess some of the characteristic features of life (motility, communication, sense/response etc.) They explore fusing living and synthetic components to form hybrid 'Cellular Bionic' systems that are biotechnologically useful. Yuval recently co-founded the pan-London fabriCELL centre, which brings together researchers devoted to the grand challenge of creating an artificial cell from the bottom-up.

INDUSTRY STREAMS: PARALLEL SESSIONS

#ChemistryFutures

PANEL DISCUSSION: INNOVATION AND CHEMISTRY

14:00 – 13:00 Lecture theatre

Previously, entering the start-up space as a chemistry company has been challenging with the need for space and support of patents being significant barriers to entry. During this panel, we will discuss how these models are changing and how there is a convergence of non-traditional disciplines into the world of chemistry. What new models are entering the market? How might new methods enable quicker and more enabled futures? Join our panel where we will discuss chemistry innovation and its myriad of applications. This is a discussion including startups, corporate labs, academia and emerging innovation models.

Facilitated by: Joe Palca

Panellists:



PROFESSOR OSCAR CES

Professor of Chemical Biology
& Co-Director, Imperial College Advanced Hackspace

Oscar Ces is a Professor of Chemical Biology at the Department of Chemistry at Imperial College London and a Fellow of the Royal Society of Chemistry. He is currently Director of the Institute of Chemical Biology (ICB), the ICB Centre for Doctoral Training, the Leverhulme Doctoral Training Centre for Cellular Bionics and Co-Director of both Fabricell and the Imperial College Advanced Hackspace. His research is focussed on biomembrane engineering, drug-membrane interactions, biomimicry, soft condensed matter, chemical biology, microfluidics, artificial cells, single cell analysis and lipid membrane mechanics.



HENRIK HAGEMANN

Chief Executive Officer &
Co-Founder, CustoMem Limited

Henrik Hagemann is the CEO and co-founder of CustoMem Ltd. (2015), focusing on engineered biomaterials that target chemicals in water. His work has been recognised by an MIT Tech Review 35 Innovators Under 35 Europe.

Previously he has co-founded a social enterprise (2009) and a synthetic biology society, SynBIC (2014). He completed a 1st class Masters in Bioengineering at Imperial College London with the 2015 Outstanding Student Achievement medal.



HELENE STEINER

Co-Founder, Open Cell

Helene Steiner is a designer and engineer who works at the interface between technology and science. She co-founded Open Cell with the mission to provide affordable lab space to early stage startups innovating at the intersection of design and biology. She is the co-founder of a biotech company, Cell-Free Technology, where she develops computational and biological design tools for proteins and materials and leads the biomaterial platform at the fashion department at the Royal College of Art. She was previously a postdoc research fellow in Microsoft Research Cambridge where she developed biological interfaces. She has been hosted as a visiting research fellow in the Tangible Research group of the MIT Media Lab. She holds a MDes from the Bauhaus University, MA from the Royal College of Art and an MSc from Imperial College London. She has been awarded a Frontier of Science, Kavli Fellowship by the National Academy of Sciences.



STEVEN O'CONNELL

Associate Director &
Programme Manager, RebelBio

Steven is the Associate Director & Programme Manager for RebelBio. One of the leading early-stage life science investment programmes globally backed by SOSV. He is an experienced & dedicated business professional with experience in building over 60 early-stage biotech, deeptech & health tech companies to date with a focus on both European, UK & American markets.



DR BEENA RAI

Principle Scientist, TCS

Dr Beena Rai is heading Physical Sciences Research at Tata Consultancy Services. Her research focuses on materials informatics especially molecular modeling based design and development of materials and chemicals. She has 150 research papers and 60 granted patent/patent applications to her credit. She has been a Chevening Scholar at Said Business School, University of Oxford. She has received several honors like Distinguished Alumnus of National Chemical Laboratory Pune and Materials Research Society of India Medal.

FUTURES WORKSHOP: FOOD SECURITY AND WORLD CHALLENGES

14:00 – 15:00 Seminar room

How might chemistry be used to create resilience in the food system? There is a strong need to create food systems that are resilient and equal. In a world of evolving technology, global markets and a changing climate there might be novel opportunities to create future visions of what food security might become. Two visionary perspectives will help create the future context; Vincent Doumeizel on safe and sustainable food systems; Dr Laura Barter and Dr Rudiger Woscholski on how chemistry can be instrumental in the future of agriculture. In a collaborative session, we will then together create future headlines of food and food security.

Facilitated by: Maria Jeansson



VINCENT DOUMEIZEL

Vice President Food and Sustainability, Lloyd's Register

Vincent Doumeizel joined Lloyd's Register in 2014, as Vice President for Food & Sustainability at group level serving over 100+ countries and tens of thousands food clients with verification & business assurance solutions.

Vincent also supports actively the charitable objectives of the Lloyd's Register Foundation (LRF), notably through the identification & funding of innovative projects to drive sustainability in the food supply chain. He is also member of various Advisory Boards for food universities research projects as well as disruptive blockchains or biotech start-ups all over Europe.

He has led the LRF Foresight Review on Food Safety supported by global food thought leaders and is a regular speaker at some of the world's leading events including COP (United Nations), FAO & OECD conferences as well the Global Food Safety Initiative.



DR LAURA BARTER

Senior Lecturer, Department of Chemistry

Laura Barter is a Senior Lecturer in the Chemistry Department with a particular focus on Plant Chemical Biology. The underlying theme of research in the Barter group is to determine quantitative structure-function relationships in biological systems employing optical spectroscopic, biochemical & proteomic techniques allied with modelling & calculation. Laura is a co-founder and co-director of AGRI-net and the Agri Futures Lab, and deputy director of the EPSRC Chemical Biology CDT.



DR RUDIGER WOSCHOLSKI

Reader in Chemical Biology, Department of Chemistry

Dr Rudiger Woscholski is a Reader in Chemical Biology whose principal research interests are at the interface of the physical and life sciences. He is keen to apply chemical tools and techniques to solve biological problems with a particular focus on enzymes and catalysts controlling the metabolism of signalling molecules and their cellular function. He is a co-founder and co-director of AGRI-net, the Agri Futures Lab and the Institute of Chemical Biology.

FUTURES WORKSHOP: THE CHEMISTRY OF HEALTHY AGEING

14:00 – 15.00 Seminar room

What if you could control ageing? What if you could improve the quality of life for people after they have turned 60?

In a collaborative session, we will explore macro-trends and technological shifts that are impacting the future of ageing, what are the opportunities that chemistry can offer and possible implications for individuals, businesses and society at large. The workshop will start with an academic vision from Dr Marco Di Antonio on how his research on DNA chemical and structural changes occurring during ageing could be targeted by synthetic molecules intervention to prevent incidence of ageing related diseases, such as dementia and cancer.

Following this, Dr Stefan Kirschbaum will discuss how Evonik are working on foresight visions that can open up for new ageing paradigms through his presentation on Aging related GameChanger,

Facilitated by: Dr Graciela Sainz De La Fuente



DR STEFAN KIRSCHBAUM

Foresight Manager, Evonik

After his PhD at the Max-Planck-Institute of Polymer Research and 3 years of experience in an industrial adhesive research laboratory, Stefan completed a MBA-Program at the Collège des Ingénieurs in Paris and joined Evonik as Foresight Manager in 2016. The foresight Team is part of CREAVIS, the strategic innovation unit of Evonik and has the task to identify innovation fields and strategic implications with a long-term perspective of 10-20 years.



DR MARCO DI ANTONIO

BBSRC Fellow, Department of Chemistry

Marco got his MSci in Chemistry in 2007 from Pavia University followed by a PhD in pharmaceutical chemistry in 2011 from Padua University. After 6 years of postdoctoral research experience in Shankar Balasubramanian's group in Cambridge he was awarded a prestigious BBSRC David Phillips Fellowship to join Imperial College Chemistry in 2018. Marco's research group focuses on studying how DNA structural dynamics regulates fundamental biological processes like natural ageing or cancer development. Marco's research aims to underpin DNA structural changes associated with ageing and to reprogram DNA architectures back to "young" states by synthetic molecule intervention, preventing the occurrence of ageing related diseases, such as cancer and dementia.

KEYNOTE AND FIRESIDE CONVERSATION

#ChemistryFutures

LIFE SCIENCE TECHNOLOGY MEGATRENDS SHAPING OUR FUTURE

15:15 – 15:40 Lecture theatre



DARLENE SOLOMON

Chief Technology Officer and Senior Vice President,
Agilent Technologies

Darlene's responsibilities include Agilent Research Laboratories which focuses on high impact, longer range research in support of Agilent's technology leadership and sustained business growth, and Agilent's programs in university relations, external research and venture investment. She works closely with Agilent's businesses to define the company's technology strategy and R&D priorities.

Following her BS in chemistry (Stanford) and PhD in bioinorganic chemistry (MIT), Darlene joined Hewlett-Packard Laboratories as a research scientist, soon moving into R&D and Technology leadership at HP and then Agilent, the HP spin-out. Solomon is a member of the National Academy of Engineering, received the USC Viterbi Engineering Management Award and is in Women in Technology International's Hall of Fame.



PROFESSOR ALAN ARMSTRONG

Head of the Department of Chemistry

Alan Armstrong is the Head of the Department of Chemistry and Professor of Organic Chemistry. He received his PhD (1990) from Imperial, carried out postdoctoral work at Columbia University, New York and held Lectureships at the Universities of Bath and Nottingham before returning to Imperial in 1999. His research interests centre on synthetic organic chemistry and its applications to catalysis and chemical biology.



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PART OF

CHEMFEST 2019

Celebrating 150 Years
of the Periodic Table

To celebrate 150 years of the periodic table, the Science Museum, the V&A, Imperial College London, Royal College of Art, Royal Commission for the Exhibition of 1851 and Royal Society of Chemistry are holding a festival of chemistry in South Kensington.