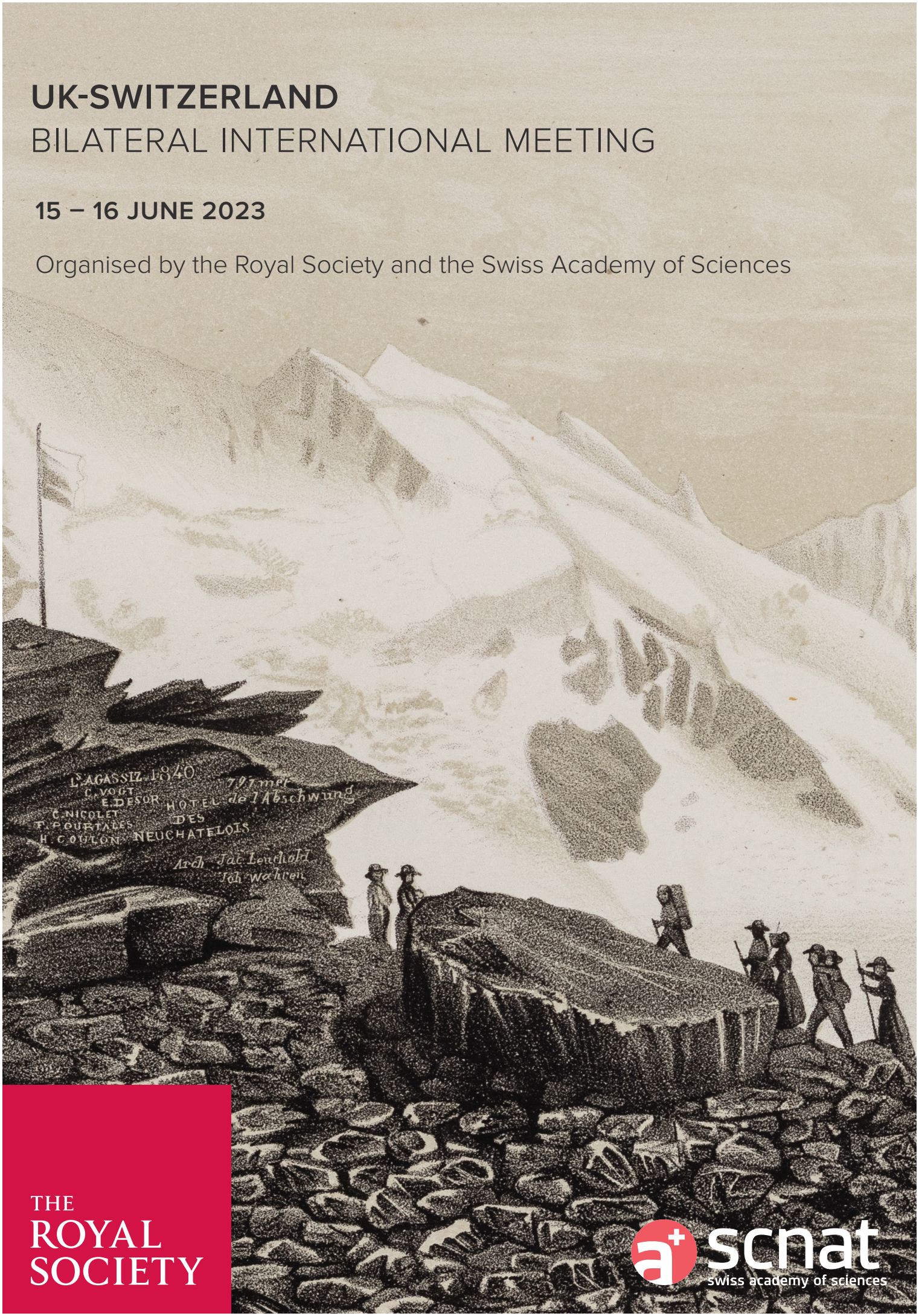
UK-SWITZERLAND
BILATERAL INTERNATIONAL MEETING

15 – 16 JUNE 2023

Organised by the Royal Society and the Swiss Academy of Sciences



THE ROYAL SOCIETY

scnat
swiss academy of sciences

This meeting is part of the Royal Society scientific programme – connecting scientists from around the world in discussions which influence their field and inspire future research opportunities.

The abstracts in this booklet are provided by the presenters and the Royal Society takes no responsibility for their content.

Cover image

Lauteraar and Finsteraar glacier from *Etudes sur les glaciers: atlas de 32 planches* (Neuchatel, 1840), a study of glaciers in Switzerland, by Jean Louis Rodolphe Agassiz (1807 – 1873). Swiss-born, American biologist and geologist, Jean Louis Rodolphe Agassiz was elected a Foreign Member of the Royal Society in 1838. He was awarded the Society's Copley Medal in 1861 for his '*researches in palaeontology and other branches of science*'. He also wrote prolifically on polygenism and was a proponent of scientific racism.

June 2023 DES8503_1

Dear participant,

Welcome to this UK-Switzerland bilateral international meeting organised by the Royal Society and the Swiss Academy of Sciences.

The objective of this meeting is to build on and strengthen scientific ties between Switzerland and the UK, and to provide opportunities for peer-to-peer scientific discussion on areas of scientific strength and opportunity, and where further collaboration might be possible.

The overarching theme for the meeting is **Facilities Science**, and the meeting will be broadly divided into two parallel streams:

1. **Facilities based materials and catalytic science for net zero**
2. **Facilities enabled biomolecular science for pandemic preparedness**

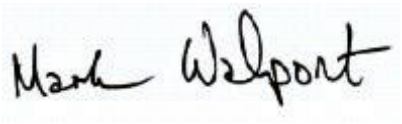
Each stream will have a programme of live talks followed by discussion sessions with speakers. There will also be a dedicated plenary talk focusing on each theme and networking with attendees from both streams present. This meeting is intended to be multidisciplinary, and designed to bring together outstanding academics in an environment which encourages informal networking and discussion.

The meeting programme has been planned by an organising committee made up of the following co-chairs:

Net zero:
• UK – Professor Sir Richard Catlow and Professor Bill David
• Switzerland – Professor Christophe Copéret and Dr Maarten Nachtegaal

Pandemic preparedness:
• UK – Professor Sir David Stuart and Professor Wendy Barclay
• Switzerland – Professor Adriano Aguzzi and Professor Gebhard Schertler

We appreciate your time and hope that this meeting proves insightful, enjoyable and collaborative.



Sir Mark Walport FRCP FMedSci HonFRSE FRS

Foreign Secretary and Vice President, the Royal Society

Contents

The Royal Society

The Royal Society is a Fellowship of the world's most distinguished scientists. Its mission is to recognise and support excellent science and to encourage the development and use of science for the benefit of humanity and the good of the planet. It was founded in 1660 and received a Royal Charter from King Charles II. It is the oldest scientific academy in continuous existence and has several roles: it is the national academy of science for the UK, a science journal publisher, a learned society and a funding agency. It also provides science advice to policymakers and advises on science education.

The Royal Society has had a hand in some of the most innovative and life changing discoveries in scientific history. It supports the UK's best and brightest young scientists, engineers and technologists, influences science policy, debates scientific issues with the public and much more.

Fellows of the Royal Society

The Society's foundation is its Fellowship, which is made up of just under 1600 of the most eminent scientists, engineers and technologists from the UK and the Commonwealth, as well as more than 200 Foreign Members from around the world. The Fellowship includes over 80 Nobel Laureates. The President of the Royal Society is Sir Adrian Smith.

Our Fellows and Foreign Members, are elected for life on the basis of scientific excellence and have included:

- Isaac Newton
- Charles Darwin
- Albert Einstein
- Stephen Hawking
- Dorothy Hodgkin

Funding

Through its research fellowships and funding programmes, the Royal Society works in partnership with universities and industry, to invest in more than 1600 scientists. Our support ranges from early career fellowships to senior professorships and grants ranging from international exchanges to travel and equipment grants. Our international grants programme enables high calibre scientists to initiate collaborations and exchange ideas with the world's leading researchers.

Science Policy and international work

The Science Policy Centre undertakes a range of activities to ensure that the Royal Society is one of the world's most influential and authoritative sources of scientific advice. Its work covers five broad themes: research innovation, wellbeing, data, resilience and emerging technologies, and education.

International engagement has always been an integral part of the Royal Society's mission. Our international work encourages global cooperation on science policy, promotes individual and institutional scientific capacity building in developing countries, and supports international scientific collaboration.

Education

The Society's interest in education stems from a belief that knowledge of science and mathematics are important for an individual's success in life. Our unique position in the science community, combined with an excellent reputation in the education community, means that we can provide influential, unique policy advice, and support activities that bring together the best of science and education for the future of young people.

Science communication

The Society's innovative programme of inspirational activities helps us reach a wider audience. Our annual Summer Science Exhibition comprises competitively selected exhibits with plentiful hands-on and interactive participation, giving visitors the opportunity to talk to the scientists behind the work.

The Society's Scientific Programme brings scientists from around the work to present and discuss new research in rapidly developing areas of science across all disciplines. Our scientific meetings are organised by key thought leaders and have been held at the Society for most of our history.

Centre for History of Science

An extraordinary and unrivalled record of the development of science that spans nearly 350 years, the Society's Centre for the History of Science is home to our unique archives. It also focuses on widening access to our collections through the online presentation of digitised heritage material, lectures and conferences.

For more information on any of our activities, please visit our website: royalsociety.org

The Swiss Academy of Sciences (SCNAT)

The SCNAT and its network are committed to a sustainable society and science. They support politics, administration and business with specialist knowledge and maintain a dialogue with the public. They strengthen the exchange across scientific disciplines and promote young scientists.

An independent network

The SCNAT is an independent network and specialist organisation in the area of education, research and innovation. It raises public awareness of the natural sciences as a central pillar of Switzerland's cultural and economic development. The approximately 35,000 experts in the SCNAT network are committed to a sustainable society and science. These researchers are organised in the SCNAT's disciplinary and thematic platforms. These platforms also bring together the specialist societies of the various scientific disciplines as well as the cantonal and regional natural research societies.

Scientific policy advice

Already when it was founded in 1815, the Academy was a scientific organisation oriented towards society. For example, its geological maps were important for the Confederation's railway and road construction projects, and its meteorological and hydrological research improved weather forecasts. In the 21st century, the SCNAT advises politics and society on issues of sustainability, such as climate, energy, biodiversity, land use and resources. To this end, the disciplinary and thematic platforms work with their specialist societies on topics that are important for both society and science policy.

For a sustainable society

The natural sciences are a central pillar of cultural and economic development. Together with its network, the SCNAT strengthens this awareness and promotes dialogue between science and the public. It supports the sustainable development of society with expert knowledge. To this end, the SCNAT is involved in the areas of scientific policy advice, promotion of young scientists and dialogue with the public.

For sound science

The SCNAT is committed to an effective Swiss science system that serves society. It strengthens the exchange between scientific actors. It also raises awareness of the ethical responsibility of science and develops guidelines for scientific work and its use. Thematic areas to which the SCNAT pays special attention in terms of science policy are scientific culture, young scientists, inter- and transdisciplinarity, research infrastructures and networks.

Research infrastructures and networks

The SCNAT is involved in the maintenance of existing research infrastructures and the creation of new ones, and it coordinates the operation of federal observation systems and communicates their monitoring results. The SCNAT also supports the preservation and development of archives and inventories. In the case of research infrastructures, the SCNAT developed subject-specific roadmaps together with the scientific communities on behalf of the Confederation. Researchers from the SCNAT network developed these roadmaps in a bottom-up process that the SCNAT moderated in the form of disciplinary roundtables. These roadmaps identify research infrastructures that will be important in the coming years in order

to achieve the goals of Swiss research. Accordingly, these roadmaps form a planning basis for the national roadmap for research infrastructures for the years 2025-2028.

International cooperation

The SCNAT is involved in important scientific networks and programmes worldwide. In science policy committees, it advocates optimal framework conditions for Switzerland and thus contributes to strengthening the country's position as a science location. In particular, it is a member of the International Science Council (ISC), an umbrella organisation with over 140 national and regional science organisations and more than 40 international professional unions. For six years (2016-21), the SCNAT also held the leadership and management of the group of European ISC Members. Through its disciplinary platforms, the SCNAT also supports the membership of Swiss national committees in international professional unions.

https://scnat.ch/en

Thursday 15 June 2023			
08.30	Registration and coffee		
08.50	Welcome and Introduction		
09.00	Plenary talk: **The Challenge of Net Zero** by **Professor Peter Styring**		
09.40	*5 minutes to allow speakers to move into separate meeting rooms*		
Net zero (Conference Room)		**Pandemic Preparedness (Dining Room)**	
Session 1: Net zero and large scale facilities: setting the stage		Session 1: The zoonotic origin: expecting the unexpected	
09.45	**Graham Hutchings** *Catalysis for net zero*	09.45	**Massimo Palmarini** *Zoonotic avian influenza viruses evade human BTN3A3 restriction*
10.15	**Thomas Schmidt** *Electrochemical Energy Conversion and Storage for the NetZero Society*	10.15	**Volker Thiel** *E Pandemic preparedness before and after SARS-CoV-2*
10.45	Discussion	10.45	Discussion
11.05	**Coffee**		
Session 2: Sorbents and thermo-catalysis for net zero		Session 2: Novel pathogens: Identifying the threat in hosts and the environment	
11.30	**Christoph Mueller** *CO2 sorbents and heterogenous catalysts: From model systems to (in situ/operando) structural characterization*	11.30	**Tamar Kohn** *Environmental monitoring of pathogens*
12.00	**Chris Hardacre** *Utilisation of XAS and neutron scattering to study heterogeneously catalysed reactions*	12.00	**Sharon Peacock** *Lessons learnt from sequencing SARS-CoV-2 during the pandemic response*
12.30	Discussion	12.30	Discussion
12.50	**Lunch**		
Session 3: Quo Vadis X-ray spectroscopy at light sources		Session 3: Digging deeper: sequencing	
13.50	**Sofia Diaz Moreno** *Hard X-ray Spectroscopy at Diamond for Catalysis and Energy Science*	13.50	**Greg Towers** *What's special about pandemic viruses, HIV vs SARS-CoV-2*
14.20	**Nina Genz** *X-ray spectroscopy for catalysis and energy science at SLS 2.0*	14.20	**Niko Beerenwinkel** *Early detection and surveillance of SARS-CoV-2 genomic variants in wastewater*
14.50	Discussion	14.50	Discussion
15.10	**Coffee**		
Session 4: Neutrons for net zero		Session 4: The fast lane for preventing and protecting	
15.40	**Andreas Borgschulte** *Mass transport in renewable energy devices by neutron imaging*	15.40	**Francesco Stellacci** *Broad Spectrum Antivirals*
16.10	**Tristan Youngs** *Total Neutron Scattering: What can it offer in the study of heterogeneous catalysts?*	16.10	**Tess Lambe** *Lessons learnt from COVID-19 vaccine development*
16.40	Discussion	16.40	Discussion
17.00	**Close of day 1**		
18.00	Drinks reception at the Swiss Embassy		
19.15	Dinner at the Great Central Pub, The Landmark Hotel		

Friday 16 June 2023			
8.30	Registration and coffee		
8.45	Plenary talk: **The Challenge of Pandemic Preparedness** by **Professor Sir Mark Walport**		
9.25	*5 minutes to allow speakers to move into separate meeting rooms*		
Net zero (Dining Room)		**Pandemic Preparedness (Conference Room)**	
Session 5: Catalysts and small molecule activation		Session 5: Understanding disease and the virus host interface	
09.30	**Andy Beale** *Operando X-ray Spectroscopy & Scattering Measurements of Catalysts Used in Small Molecule Reduction*	09.30	**Claire Smith** *Revealing Age-Associated Differences in SARS-CoV-2 Infection using Nasal Epithelial Cell Cultures*
10.00	**Murielle Delley** *Catalysis By Inorganic Materials: Control At The Surface By Tailored Interfaces And Electric Fields*	10.00	**Joep Beumer** *Human adult stem cell-derived organoids to model viral infection and essential host factors*
10.30	Discussion	10.30	Discussion
10.50	**Coffee**		
Session 6: Next generation batteries and the need for spatial resolution for catalysis		Session 6: The immune response to infection	
11.10	**Kostiantyn Kravchyk** *Pyrochlore Iron (III) hydroxyl fluoride as Low-Cost Lithium-Ion Cathode Material for Stationary Energy Storage*	11.10	**Adriano Aguzzi** *Arrayed high-throughput serology and forward genetics*
11.40	**Peter Wells** *Spatially resolved methods for operando spectroscopy*	11.40	**Gavin Screaton** *Antibody responses to SARS-CoV-2*
12.10	Discussion	12.10	Discussion
12.30	**Lunch**		
Session 7: Neutrons and X-rays		Session 7: Cellular virology: Understanding the cellular life of viruses in host cells	
13.15	**Victoria Garcia Sakai** *Neutron Spectroscopy as a tool to solving some of today's societal challenges*	13.15	**Wendy Barclay** *Host barriers to the emergence of influenza pandemics*
13.45	**Matthias Arenz** *In situ and operando studies in electrocatalysis*	13.45	**Francisco Mesquita** *Why Lipids and Lipid Modifications are central for the biology of enveloped viruses?*
14.15	Discussion	14.15	Discussion
Session 8: Looking across scales		Session 8: The role of large research infrastructure in pandemic preparedness	
14.35	**Raffaella Buonsanti** *Colloidal chemistry to advance catalysis and energy technologies*	14.35	**Marco Stampanoni** *Leveraging Large Research Infrastructure for Pandemic Preparedness: Advancing Understanding and Interventions through Tomographic Imaging and Protein Crystallography - the SLS experience*
15.05	**Alexander O'Malley** *Neutron spectroscopy studies of molecular behaviour in microporous catalysts*	15.05	**Frank von Delft** *TBC*
15.35	Discussion	15.35	Discussion
15.55	*5 minutes to allow speakers to move into main meeting room (Coffee to be available)*		
16.00	Panel discussion		
16.50	Closing remarks		
17.00	**Meeting close**		

Meeting day 1 - Thursday 15 June 2023

Opening remarks

Professor Sir Richard Catlow FRS
Cardiff University/University College London, UK

Richard Catlow is developing and applying computer models to solid state and materials chemistry — areas of chemistry that investigate the synthesis, structure and properties of materials in the solid phase. By combining his powerful computational methods with experiments, Richard has made considerable contributions to areas as diverse as catalysis and mineralogy.

His approach has also advanced our understanding of how defects — missing or extra atoms — in the structure of solids can result in non-stoichiometric compounds. Such compounds have special electrical or chemical properties since their contributing elements are present in slightly different proportions to those predicted by chemical formula.

Richard's work has offered insight into mechanisms of industrial catalysts, especially involving microporous materials and metal oxides. In structural chemistry and mineralogy. Simulation methods are now routinely used to predict the structures of complex solids and silicates, respectively, thanks to Richard's demonstrations of their power.

Richard was Foreign Secretary of the Royal Society from 2016 until 2021.

Dr Marc Türler
Swiss Academy of Sciences (SCNAT), Switzerland

Marc Türler is the Head of the Science Division and of the Platform Mathematics, Astronomy and Physics at the Swiss Academy of Sciences (SCNAT). He is leading the SCNAT project on the elaboration of thematic, community roadmaps for research infrastructures. He got his PhD in 2000 at the University of Geneva in high-energy astrophysics and collaborated on the INTEGRAL and Planck space missions of the European Space Agency. Next to scientific research, he worked as executive secretary for the European Astronomical Society and the Swiss Institute of Particle Physics. He was also scientific collaborator at the Swiss National Science Foundation for one and a half year, before moving to SCNAT in 2018.

Meeting day 1 - Thursday 15 June 2023

Plenary talk

Professor Peter Styring
University of Sheffield, UK

Professor of Chemical Engineering & Chemistry and Associate Fellow in the Understanding of Politics. Research focus on carbon dioxide capture and utilisation (CCU) and the development and commercialisation of novel carbon capture technologies. Author on several books on CCU and strategic advisory board member of the Global CO_2 Initiative. Research into the Circular Chemical Economy and creating an ecosystem where we are custodians rather than consumers of carbon and other materials. https://bit.ly/3Mi6rNl

The Challenge of Net Zero

Carbon is the element of life and an essential component of most of the materials and chemicals that characterise modern living. We are now at a crossroads where we need to move from a linear economy of extract-use-dispose to a circular economy where we re-use and recycle carbon. We are therefore standing at the start of a new industrial revolution. We now need to become custodians rather than users of carbon, where carbon provenance will become of primacy. Carbon dioxide utilisation will hold at least one of the keys to unlock the future.

We will need policy change, financial and fiscal realignment, and innovation to open new markets. The Flue2Chem Project is set to become a game changer not only because of the ground-breaking science and engineering, but also because it brings together global industrial and academic leaders in a unique consortium that aims to innovate through collaboration within an extended supply chain ecosystem. This Keynote Lecture will consider the background to the project and how carbon dioxide can be captured and converted into surfactants that will remove fossil carbon from the supply chain. The stakes are high, but so are the rewards. Funded by Innovate UK and involving 13 companies and 2 universities the urgency for change is reflected in that a short 24-month timescale to delivery has been mandated.

Meeting day 1 – Thursday 15 June 2023

Net Zero

Session 1: Net zero and large scale facilities: setting the stage

Co-chair: Professor Christophe Copéret
ETH Zurich, Switzerland

Professor Christophe Copéret is Professor of Chemistry at ETHZ and works in the area of catalysis, surface chemistry, spectroscopy and data-driven high-throughput experimentation.

Professor Graham J Hutchings CBE FRS
Cardiff University, UK

Graham Hutchings is Regius Professor of Chemistry at Cardiff University. He studied chemistry at University College London and also a PhD in biological chemistry in 1975. His early career was with ICI and AECI Ltd where he became interested in gold catalysis. In 1984 he moved to academia and has held chairs at the Universities of Witwatersrand, Liverpool and Cardiff. His main interests are in oxidation catalysis with a special interest in catalysis by gold. He was elected a Fellow of the Royal Society in 2009, a Member of Academia Europaea in 2010 and a Founding Fellow of the learned Society of Wales in 2010. He was awarded the Davy Medal of the Royal Society in 2013, the ENI Award for Advanced Environmental Solutions in 2017, the RSC Faraday Lectureship and Prize in 2018, a CBE in the Queen's Birthday Honours List in 2018 and the 2021 Michel Boudart Award.

Catalysis for net zero

Meeting the net zero targets will not be possible without new catalysts and catalytic processes. New sources of sustainable carbon together with sustainably sourced electricity will be required for the production of chemicals and carbon-based fuels that will still be required for legacy infrastructure in aviation and maritime travel. This presentation will introduce and discuss the possibilities for the new approaches that will be required.

Professor Thomas Schmidt
Paul Scherrer Institute, Switzerland

Thomas J Schmidt is a professor and the Chair for Electrochemistry, ETH Zurich and Head of the Energy & Environment Research Division at PSI. He studied chemistry at the University of Ulm, Germany and then continued his career as a postdoctoral researcher and scientist at Lawrence Berkeley National Laboratory and at PSI. After 8 years in industrial fuel cell research (BASF Fuel Cell) as a director of R&D, he became Chair of Electrochemistry at ETH Zurich and Head of the Electrochemistry Laboratory at PSI in

2011. Between 2014 and 2021, he also acted as a director of the Swiss Competence Center for Energy Research, Heat & Electricity Storage. In 2018, he assumed the role as the Head of the Energy & Environment Research Division at PSI and became a member of the PSI directorate. Since 2023, he is the Director of the Swiss Center of Excellence for NetZero Emissions. His work is focused on all aspects of electrochemical energy conversion and storage.

Electrochemical Energy Conversion and Storage for the NetZero Society

The Swiss Federal Council as well as many other governments set the ambitious goal to reach net-zero greenhouse gas emissions by mid of the century. As the required systemic and societal transitions will take decades, urgent action is imperative, as highlighted by the recent IPCC Report. Despite the well-defined target, many questions remain concerning transition pathways, social acceptance, technology developments, regulatory frameworks, and business cases. The diversity of these challenges clearly shows that only an integrated and trans-disciplinary approach can generate the required impact and guide stakeholders toward the NetZero target.

Electrochemical Conversion and Storage Technologies will undoubtedly play a critical role in the NetZero energy system, ie, technologies such as water electrolysis, fuel cells, co-electrolysis and batteries. In this presentation, some insights on the materials used in such technologies will be provided, guiding the pathways towards more efficient conversion and storage of energy.

Session 2: Sorbents and thermo-catalysis for net zero

Co-chair: Professor Bill David FRS
STFC / University of Oxford

Bill David is Professor of Energy Materials Chemistry in the University of Oxford, STFC Senior Fellow at the Rutherford Appleton Laboratory and a Fellow of the Royal Society. Bill is also CSO of Sunborne Systems (sunbornesystems.com) which is focussed on bringing keystone ammonia-based technologies to market for the global zero-carbon energy infrastructure.

Professor Christoph Müller
ETH Zurich, Switzerland

In 2008, Christoph Müller earned his PhD from the University of Cambridge, UK (Department of Chemical Engineering) and was appointed assistant, associate and full professor (Department of Mechanical and Process Engineering, ETH Zurich) in 2010, 2015 and 2019, respectively. He heads the Laboratory of Energy Science and Engineering which focuses on CO_2 capture, heterogeneous catalysis and granular flows.

CO_2 sorbents and heterogenous catalysts: From model systems to (in situ/operando) structural characterization

One approach to enable the transition to sustainable societies relies on the capture and conversion of CO_2 to close the carbon cycle. To this end, the availability

of inexpensive, robust, yet at the same time highly active CO_2 sorbents and heterogeneous catalysts is critical. In his talk Professor Müller will introduce metal-oxide based CO_2 sorbents and CO_2 conversion catalysts, describe their advantages and deactivation routes and highlight the importance of (in situ/operando) structural characterization to advance their design.

Professor Chris Hardacre
University of Manchester, UK

Chris Hardacre is Head of the School of Natural Sciences at The University of Manchester. His group focuses on ionic liquids and catalysis, with projects in environmental and biomass processing, energy, fine chemical synthesis, plasma catalysis for emission control and clean hydrogen production. His work has centred around developing new catalytic processes as well as investigating the structure-activity/selectivity relationships using in situ spectroscopic and structural methods. He has >490 papers and 11 patents. He was part of the Queen's University Ionic Liquid Laboratory, which attained the Queen's Award for Further and Higher Education in 2006. Awarded the RSC Teamwork in Innovation (2005), the USA 2008 R & D 100 award, the IChemE Andrew Medal for Catalysis (2013) and the RSC Tilden Prize (2022). He is a co-PI of the UK Catalysis Hub.

Utilisation of XAS and neutron scattering to study heterogeneously catalysed reactions

This presentation will use X-ray Absorption Spectroscopy and neutron scattering to understand liquid and gas phase catalysis. Both thermally activated reactions and those under non-thermal plasma control will be investigated and compared using in-situ spectroscopic and structural methods. In the case of plasma assisted catalysis, three recurring hypotheses are often proposed to understand its interaction with the catalyst. Firstly, that the plasma modifies the catalyst, secondly, that the plasma heats the catalyst, and thirdly, that the assistance of the plasma permits new reaction pathways to occur. The plasma has been shown, in some cases, to alter the catalysts itself by, changing the oxidation state or metal surface area of the components. In addition, several attempts have been made to determine the temperature of a catalyst during plasma reactions, using thermocouples placed near or in the catalyst bed, via infrared cameras or optical emission spectroscopy. However, no study has yet directly measured the temperature of the metal nanoparticles within the catalyst or the structure of the catalyst. XAS has been used to examine these properties under plasma conditions for CH4 oxidation and these compare with thermal activation. In the case of neutron scattering, the presentation will show the development of a combined NMR-neutron technique used to examine the liquid structure during hydrogenation reactions over supported metal catalysts.

Session 3: Quo Vadis X-ray spectroscopy at light sources

Co-chair: Dr Maarten Nachtegaal
Paul Scherrer Institut, Switzerland

Maarten Nachtegaal is heading the operando spectroscopy group at the Paul Scherrer Institut which operates the SuperXAS beamline at the Swiss Light Source for X-ray absorption and emission spectroscopy, and currently constructs the Debye beamline for

combined X-ray absorption, diffraction and total scattering experiments.

He earned his MSc degree in geochemistry from Utrecht University (the Netherlands), a PhD in environmental chemistry at the University of Delaware (USA) followed by a postdoctoral position at the ETH in Zurich (Switzerland) before taking up his current position. The focus of his research moved from environmental chemistry to heterogeneous/photo/electro-catalysis, primarily employing novel spectroscopic techniques under operando conditions. Recurrent themes are a strong interest in cross-disciplinary research and the development of new operando experimental methods.

Dr Sofia Diaz-Moreno,
Diamond Light Source, UK

Sofia Diaz-Moreno is the science group leader for Spectroscopy at Diamond Light Source where she is responsible for a large science and technical team operating and developing four state-of-the-art X-ray spectroscopy beamlines.

Her personal research programme aims to relate the local structure of solutions and complex materials to their chemical, physical or biochemical properties, using advanced synchrotron X-ray and neutron scattering methods. Her research projects primarily make use of conventional XAS, high-resolution X-ray absorption, and resonant/non-resonant emission spectroscopies that are frequently integrated with bespoke in-situ and operando experiment configurations. Alongside her scientific projects, Sofia has a strong interest in developing new instrumentation that advances X-ray spectroscopy research and supports the international X-ray Absorption Spectroscopy community as the Chair of the XAFS commission of the International Union of Crystallography, and the Vice-Chair of the International X-ray Absorption Spectroscopy Society.

Hard X-ray Spectroscopy at Diamond for Catalysis and Energy Science

Since it started operations in 2007, Diamond has become a key facility for the study of materials and chemical processes. In particular, research in chemistry and catalysis is a major part of their activity (>25%), supported strongly by the Catalysis Hub. Among the many structural techniques available at Diamond, X-ray Absorption and Emission Spectroscopies (XAS/XES) are widely used to obtain structural and electronic information on the local environment of a photo-absorbing atoms in a broad variety of systems. These experiments are often performed in situ and under operando conditions.

The Spectroscopy Group at Diamond is formed by three beamlines optimized to perform X-ray spectroscopy in the hard X-ray regime. The beamlines are very complementary in the energy ranges they cover as well as the time scales they reach.

In this talk, Dr Diaz-Moreno will highlight the current capabilities of the group, illustrated through science examples, and will also give a brief introduction to SWIFT (Spectroscopy WithIn Fast Timescales), the flagship beamline project that will be built as part of Diamond-II, the planned upgrade of the synchrotron.

Dr Nina S Genz
Paul Scherrer Institute, Switzerland

Dr Nina S Genz recently started a tenure track position at the SuperXAS beamline at the Paul Scherrer Institute, Switzerland, in the field of operando spectroscopy of functional materials. Before she moved to Switzerland, she did her postdoctoral stay at Utrecht University, the Netherlands, in the Inorganic Chemistry and Catalysis group. For her postdoctoral research focusing on operando characterization of multi-metal CO_2 hydrogenation catalyst materials with a special emphasis on both laboratory-based and synchrotron-based X-ray techniques, she obtained a Walter Benjamin Fellowship from the German Research Foundation (Deutsche Forschungsgemeinschaft). In 2019, she obtained her PhD in chemistry at Technical University Berlin, Germany.

X-ray spectroscopy for catalysis and energy science at SLS 2.0

At the end of September this year SLS will be upgraded to SLS 2.0, which will not only provide a higher ring energy (2.7 GeV vs 2.4 GeV) and more coherent X-ray beams but will also consume 30% less energy. Dr Genz will give an overview of the beamlines for X-ray spectroscopy at SLS 2.0, that are especially powerful for catalysis and energy science. The VUV beamline offers the PEPICO technique, which allows studying short-lived reaction intermediates. The APXPS beamline gives access to XPS at near ambient conditions. The Phoenix beamline covers the tender X-ray range, where XES and XAS measurements, combined with laser pump – X-ray probe schemes are possible. In the hard X-ray range, the SuperXAS beamline allows to study the local electronic and geometric structure of the element of interest through sub-second XAS (QEXAFS) and XES, and in the ns to ms time regime through pump-probe XAS. Finally, the new Debye beamline, which goes up to energies of 60 keV allows for high throughput studies on energy materials by combined QEXAFS, powder XRD and total scattering studies.

Session 4: Neutrons for net zero

Co-chair: Professor Sir Richard Catlow FRS
Cardiff University/University College London, UK

Professor Andreas Borgschulte
Empa Switzerland, Switzerland

Andreas Borgschulte is a physicist with focus on Applied Spectroscopy. He obtained his PhD in physics from TU Braunschweig (Germany) in 2002. After a postdoc at the VU Amsterdam (Netherlands) and Helmholtzzentrum Geesthacht (Germany); he became group leader of the group Hydrogen Spectroscopy at Empa. He is lecturer at University Zurich and ETH Zurich.

Mass transport in renewable energy devices by neutron imaging

The technical implementation of fundamental scientific results into a real working device is a challenging long-term journey. Operando neutron imaging allows the visualization of chemical processes inside running devices, such as batteries, chemical reactors, and even mass/heat

ex-changers. In this talk, Professor Borgschulte will showcase example where neutron imaging gave scientific insights helping to improve the devices. Sorption enhanced methanation is a novel process to reach high methanation concentration prerequisite for the feed of synthetic natural gas into the natural gas grid. Neutron imaging confirmed the specific macroscopic reaction kinetics resulting in the formation of a reaction front in the reactor, laying the foundation of a rational reactor design. For a heat storage application, we visualized the water uptake and distribution in a mass/heat exchanger by high-temporal resolution neutron imaging experiments, from which a new design with markedly enhanced performance was deduced. Neutron tomography of Ni-MH batteries visualizes the mobility of hydrogen during charging, ie, the hydrogen exchange between the electrodes as well as hydrogen generated by side reactions. He will present concepts and discuss potential for future applications focused in particular on the domain of renewable energy research.

Dr Tristan Youngs
STFC Rutherford Appleton Laboratory, UK

Tristan Youngs has been researching disordered materials using combined atomistic simulation and neutron scattering for almost 20 years. He obtained is PhD in computational chemistry at the University of Reading, and subsequently moved to the Atomistic Simulation Centre at Queen's University Belfast where he focussed on the simulation and neutron diffraction of ionic liquids. Currently part of the Disordered Materials group at the ISIS Pulsed Neutron and Muon source at STFC Rutherford Appleton Laboratory he is jointly responsible for the Near and InterMediate Range Order Diffractometer total scattering instrument. He has a particular interest in combining secondary analysis techniques as in situ counterparts to the neutron measurements, and how those techniques may be exploited in complex systems such as heterogeneous catalysts. He is the lead author and project manager of the Dissolve code, a simulation and analysis package for disordered materials research on complex materials.

Total Neutron Scattering: What can it offer in the study of heterogeneous catalysts?

Total neutron scattering can offer a comprehensive picture of the structure of materials and has been successfully applied over the past 25 years to a wide variety of systems covering simple liquids and liquid mixtures, ionic liquids, glasses, self-assembled micelles, and fluids under nanoconfinement. For the latter class of materials neutron diffraction is an excellent choice in general since it is non-destructive, highly penetrative, and hydrogen-sensitive. However, with increasing complexity – eg number of components, sample inhomogeneity, or systems undergoing change, all of which are relevant to, in particular, heterogeneous catalysis – come additional challenges for the experimental technique, the data reduction, and the core analysis techniques we employ which are all based around atomistic simulation.

Here, Dr Youngs will give an overview of the techniques employed in total neutron scattering research of complex disordered materials, their limitations, and the current state of the art and future direction of the methodology in the context of heterogeneous catalysis research.

Meeting day 1 – Thursday 15 June 2023

Pandemic Preparedness

Session 1: The zoonotic origin: expecting the unexpected

Co-chair: Professor Sir David Stuart FRS

Oxford University/ Diamond Light Source, UK

Professor Sir David Stuart is a Medical Research Council Professor of structural biology at the Wellcome Trust Centre for Human Genetics at the University of Oxford and Life Science Director at the Diamond synchrotron. He is an expert in virus structure and antiviral/antibody interactions.

Professor Massimo Palmarini

MRC-University of Glasgow Centre for Virus Research, UK

Massimo Palmarini is the Director of the MRC-University of Glasgow Centre for Virus Research and Chair of Virology at the University of Glasgow. A veterinarian by training, his research programmes have spanned diverse areas including animal retroviruses, the biology, evolution and pathogenesis of arboviruses and the mechanisms of virus cross-species transmission. His work is funded by the MRC and the Wellcome Trust. Massimo Palmarini has been elected Fellow of the Academy of Medical Sciences, of the Royal Society of Edinburgh and of the Royal Society of Biology and he was a Wolfson-Royal Society Research Merit Awardee. He is a Wellcome Trust Investigator and received an OBE for services to Public Health in 2021.

Zoonotic avian influenza viruses evade human BTN3A3 restriction

Spillover events of avian influenza A viruses (IAV) to humans could represent the first step of a future pandemic. Multiple factors limiting the transmission and replication of avian IAV in mammals have been identified. There are several gaps in our understanding in order to predict which virus lineages are more likely to cross the species barrier and cause disease in humans. His group identified human BTN3A33 (butyrophilin subfamily 3 member A3) as a potent inhibitor of avian but not human IAV. They determined that BTN3A3 is expressed in human airways and its antiviral activity evolved in primates. They show that BTN3A3 restriction acts primarily at the early stages of the virus life cycle by inhibiting avian IAV RNA replication. They identified residue 313 in the viral nucleoprotein (NP) as the genetic determinant of BTN3A3 sensitivity (313F, or rarely 313L in avian viruses) or evasion (313Y or 313V in human viruses). However, serotypes such as H7 and H9, of avian IAV that spilled over into humans evade BTN3A3 restriction. In these cases, BTN3A3 evasion is due to substitutions (N, H or Q) in NP residue 52 that is adjacent to residue 313 in the NP structure. Thus, sensitivity or resistance to BTN3A3 is another factor to consider in the risk assessment of the zoonotic potential of avian influenza viruses.

Professor Volker Thiel
University of Bern, Switzerland

Volker Thiel is an expert in coronavirus biology. He has worked on coronaviruses since the 1990s on basic aspects of coronavirus replication, immune responses and virus-host interactions. Since 2014 he is leading the division Virology at the Institute of Virology and Immunology in Bern and Mittelhäusern and is chair in Virology at the Vetsuisse Faculty, University of Bern. Since 2021 he is co-chair of the Multidisciplinary Center for Infectious Diseases, a strategic centre of the University of Bern. During the pandemic he has been a member of the National Swiss Science Task Force and is member of the Technical Advisory Group on SARS-CoV-2 Virus Evolution of the WHO.

Pandemic preparedness before and after SARS-CoV-2

The SARS-CoV-2 pandemic exemplifies the ever-present risk of zoonotic transmission and emerging diseases impacting human health and our society. We have known for many years that highly diverse SARS-related coronaviruses are circulating in numerous bat species and that some of these viruses are able to infect humans. However, we were not properly prepared for a pandemic of this scale. He will provide an overview on the scientific work during the pandemic and present an outlook on pandemic preparedness in the context of a newly established strategic centre at the University of Bern, the Multidisciplinary Center for Infectious Diseases.

Session 2: Novel pathogens: Identifying the threat in hosts and the environment

Co-chair: Professor Adriano Aguzzi MD
Institut für Neuropathologie, Switzerland

Adriano Aguzzi has devoted his professional life to deciphering the role of the immune system in prion diseases. The importance of his work is acknowledged by almost 65,000 citations (H-index: 134). Aguzzi's findings of pervasive colonization of the immune system by prions convinced governments worldwide to undertake efforts to limit human exposure to prions derived from farm animals. His finding of the B-cell requirement for prion spread was the basis of the UK's decision to introduce universal leukodepletion of blood donation – a measure that is likely to have saved thousands of human lives. His work demonstrated that chronic inflammation controls the organ tropism of prion diseases, thereby clarifying how scrapie prions propagate horizontally within sheep flocks. The realization that prion excretion results from coincident inflammation and prion infection is paving the way to the eradication of prion diseases from ruminants. His discoveries were shown to be valid for all common neurodegenerative diseases including Alzheimer's and Parkinson's.

Professor Tamar Kohn
EPFL, Switzerland

Tamar Kohn received her MSc in Environmental Sciences from ETH Zurich, and her PhD in Environmental Chemistry from Johns Hopkins University. Following her PhD, she spent two years as a postdoc at UC Berkeley, where she first started working on viruses in the environment. In 2007, she moved to EPFL as an assistant professor, and was promoted to associate professor in 2014 and to full professor in 2023. She also serves as the director of EPFL's doctoral program in Civil and Environmental Engineering, as a member of Advisory Committee to the WHO International Scheme to Evaluate Household Water Treatment Technologies, and as associate editor for Environmental Science and Technology. Her research group studies the fundamental processes controlling virus fate in natural and engineered systems. Topics of interest include virus inactivation by chemical oxidants (eg, chlorine, ozone) and natural stressors (eg, sunlight, microbial grazers), tools to monitor disinfection performance, and evolution of viruses to higher persistence phenotypes. More recently her research has also moved toward airborne viruses, where she studies the persistence of respiratory viruses in aerosol particles.

Environmental monitoring of pathogens

Environmental monitoring of pathogens is a well-established approach for the detection of disease outbreaks. Most prominently, it is used in support of the Global Polio Eradication Initiative, where it has been instrumental in capturing the introduction and mapping the silent circulation of poliovirus. The onset of the COVID-19 pandemic, and the recognition that SARS-CoV-2 can be recovered from wastewater, has led to an unprecedented global effort to establish environmental monitoring as a useful tool to track the pandemic. Despite initial scepticism by scholars from more "traditional" infectious disease disciplines, it was soon acknowledged that wastewater monitoring complements, or sometimes even pre-empts, information derived from individual clinical tests. For example, wastewater-derived data can inform on pandemic dynamics in entire communities, rapidly reveal the occurrence and distribution of variants of concern and serve as a basis to calculate the effective reproduction number of SARS-CoV-2. Consequently, wastewater monitoring now forms an integral part of many national surveillance systems of COVID-19 and other diseases (eg, influenza, monkeypox). In this presentation she will present an overview over the possibilities and limitations of wastewater monitoring for pathogen surveillance and discuss future needs to establish this approach as a permanent fixture beyond the COVID-19 pandemic.

Professor Sharon Peacock
University of Cambridge, UK

Sharon Peacock is Professor of Microbiology and Public Health at the University of Cambridge, and Non-Executive Director on the Board of Cambridge University Hospitals NHS Foundation Trust. Sharon has built her scientific expertise around pathogen genomics, antimicrobial resistance, and several tropical diseases. She founded and directed the COVID-19 Genomics UK Consortium (COG-UK), formed in April 2020 to provide SARS-CoV-2 genomes towards the UK pandemic response. Prior to this, she dedicated more than a decade to the translation of pathogen sequencing into clinical and public health microbiology, as well as

using sequencing to examine the transmission of antibiotic-resistant bacteria between humans, livestock, and the environment. She is a Fellow of the Academy of Medical Sciences (2013), Fellow of the American Academy of Microbiology (2014), and Member of the European Molecular Biology Organization. Sharon was awarded a CBE for services to Medical Microbiology in 2015, and in 2021 received the Medical Research Council Millennium Medal.

Lessons learnt from sequencing SARS-CoV-2 during the pandemic response

COG-UK was established in March 2020 to generate SARS-CoV-2 genome data for public health agencies and researchers in the UK and beyond in support of the pandemic response. A network of sequencing hubs was created between 21 UK institutions (the four public health agencies, 16 universities and the Wellcome Sanger Institute), which became networked with over 100 NHS testing labs and the Lighthouse labs. An administrative hub (in Cambridge) developed a framework of operations, while a devolved structure of working groups led on essential science innovation relating to analytical software, data structures and sequencing methods. The Consortium also adopted existing capabilities that fast-tracked the UK genomic response, including the Cloud Infrastructure for Microbial Bioinformatics and the ARTIC network methods protocols. The Consortium contained around 600 people, most of whom were volunteers. COG-UK had generated more than a million genomes by the end of 2021, all of which were made publicly available. Genomic data underpinned the detection of the emergence of variants of concern, study of the biological basis of mutations that led to enhanced (or reduced) viral fitness, and investigations into immune evasion and vaccine efficacy. It underpinned the study of transmission, outbreaks and introductions, and informed and influenced government policy. In this talk, Professor Peacock will discuss the scientific and human lessons learnt from this initiative, and what these lessons reveal as we prepare for future pandemics.

Session 3: Digging deeper: sequencing

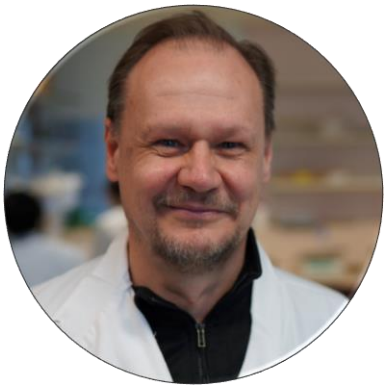
Co-chair: Professor Wendy Barclay
Imperial College London, UK

Professor Wendy Barclay is Action Medical Research Chair in Virology and Head of the Department of Infectious Disease at Imperial College London. She began her scientific career at what was then the Common Cold Unit in Salisbury and later trained in molecular virology at the University of Reading and Mount Sinai Medical Center, New York. Professor Barclay's research has focused on respiratory viruses and the factors affecting how they are transmitted and cause disease. She has contributed to the understanding of how these viruses cause pandemics, and how we can best develop strategies to combat them. Her lab's most prominent discovery is the identity of a host factor that is hijacked by the influenza virus when it replicates in our cells. She showed how differences in this factor between birds and humans explains why we don't get frequently infected by bird flu viruses. Throughout the COVID-19 pandemic, her collaborations with the UK Health Security Agency and roles on several government advisory committees provided critical evidence on emerging threats from SARS-CoV-2 and its variants. Her lab pivoted to work on the newly emerged SARS-CoV-2 virus, in projects that spanned basic virology and immunology as well as analysis of environmental samples for traces of the virus. Her laboratory's work continues to inform scientific discourse and public health policy on the potential pandemic threat of influenza strains and a host of other respiratory viruses. She is a key collaborator in numerous national scientific groups, including a national consortium

established to tackle bird flu outbreaks in the UK, as well as leading the UK's Genotype to Phenotype Virology Consortium, established to study the impact of mutations in the SARS-CoV-2 coronavirus and help UKHSA risk assess novel variants in real time as they arise.

Professor Greg Towers

University College London, UK



Greg's laboratory studies intracellular innate immunity and mechanisms of viral replication, aiming to understand how cells detect and react to infection and how viruses nonetheless manage to infect us. Greg's PhD (Institute of Cancer Research, 1995) focused on HIV transcription and postdoctoral work in London (National Institute of Medical Research, 1995-98), and Paris (Genethon Gene Therapy Institute, 1998-99) sought to understand how mice protect themselves from gammaretroviruses and monkeys protect themselves from HIV. Greg has been at UCL since 2000 and was awarded tenure in 2006. His lab takes a multidisciplinary approach, combining molecular virology, structural biology and evolutionary studies of HIV and SARS-CoV-2 to understand how viruses evolve to infect their hosts and how their hosts evolve to suppress infection. His lab is funded by the Wellcome, the US National Institutes of Health, the Medical Research Council, the Rosetrees Trust and the Evolution Education Trust.

What's special about pandemic viruses, HIV vs SARS-CoV-2

Pandemic HIV-1 results from a single zoonosis amongst 13 known zoonotic transfers of simian lentiviruses to humans. Pandemic HIV-1(M) has infected >80 million individuals but its non-pandemic counterparts are much rarer, many have only been found in single individuals. The second most common (HIV-2A) has only infected <2M people. Professor Towers and his team aim to understand what is special about pandemic HIV-1 and what characteristics correspond with pandemic levels of human-to-human transmission. They found that pandemic HIV-1 has evolved to be particularly good at avoiding activating innate immune detection in infected cells and discovered pandemic viral capsid has evolved to avoid activating TRIM5 signalling and to avoid exposure of viral DNA to host sensor cGAS. SARS-CoV-2 is the most recent pandemic human virus. They have shown that whilst it has an amazing inbuilt capacity to evade human innate immune sensing, the virus is rapidly evolving to do even better. A series of adaptations outside the Spike protein drive enhanced expression of key innate immune antagonists with the various lineages of SARS-CoV-2 following similar evolutionary trajectories of human adaptation. His team propose that the understanding of what makes pandemic viruses special will help us identify the most dangerous pandemic threats before they occur.

Professor Niko Beerenwinkel

ETH Zurich, Switzerland

Niko Beerenwinkel is full professor of Computational Biology at the Department of Biosystems Science and Engineering of ETH Zurich in Basel and a Group Leader at the Swiss Institute of Bioinformatics. His research is at the interface of mathematics, statistics, and computer science with biology and medicine. It includes statistical, evolutionary, and network modeling of molecular profiling data. He has developed several computational

methods for supporting molecular diagnostics in oncology and virology, including for the analysis of tumour single-cell genomics data and of deep sequencing data obtained from virus populations. He is currently a Royal Society Wolfson Visiting Fellow at the Cancer Research UK Cambridge Institute.

Early detection and surveillance of SARS-CoV-2 genomic variants in wastewater

The continuing emergence of SARS-CoV-2 variants emphasizes the need for early detection and epidemiological surveillance of novel variants. Wastewater samples provide an opportunity to assess circulating viral lineages in an unbiased and cost-efficient manner, but genomic analysis of wastewater samples is challenging. Professor Beerenwinkel and his team present computational approaches for analysing next-generation sequencing data obtained from mixed virus samples in the presence of amplification and sequencing errors, for early detection of low-frequency variants emerging in a population, and for estimating their transmission fitness advantage. They use these approaches in a Swiss surveillance program and monitor several wastewater treatment plants daily. They found that longitudinal wastewater sequencing data can provide population-level estimates of prevalence and fitness of emerging variants from wastewater samples earlier and based on substantially fewer samples than from clinical samples.

Session 4: The fast lane for preventing and protecting

Co-chair: Professor Marco Stampanoni

Paul Scherrer Institut and ETH Zurich, Switzerland

Marco Stampanoni has been assistant professor (2008-2013), associate professor (2013-2017) and since 2017 full professor for X-Ray Imaging at ETH Zurich, within the Department of Information Technology and Electrical Engineering at ETH Zurich. His professorship is affiliated to the Institute of Biomedical Engineering of the University and ETH Zurich, where he leads the division for X-ray Imaging and Microscopy. At the Paul Scherrer Institut, he is the head of the X-ray tomography group at the Swiss Light Source (SLS).

Born on May 10, 1974, in Lugano (Ticino, Switzerland) Marco Stampanoni studied physics at the ETH Zurich. After receiving his diploma in 1998, he graduated at the ETH in 2002 in the area of synchrotron-based tomographic microscopy. For his PhD, he received the ETH silver medal in 2003. From 1998 to 2000 he successfully followed a post-graduate course in Medical Physics. In 2002 he started as an instrument scientist at the SLS of the Paul Scherrer Institut in Villigen, Switzerland. In 2004 he was nominated beamline scientist and responsible for the development and realization of a tomography dedicated beamline at the SLS. In 2005 he was elected Head of the "X-ray Tomography Group" of the SLS. In 2008 he was appointed Assistant Professor (Tenure Track) for X-ray Microscopy at the ETH Zurich and, in 2010, Director of the ETH-Master of Advanced Studies in Medical Physics. In 2012 he received an ERC Grant for his project on phase contrast X-ray imaging and won the Dalle Molle Foundation Award for his pioneering work on X-ray phase contrast mammography. He is teaching at ETH Zurich in the field of X-ray microscopy. Since 2018 he is the President of the Research Commission of the Paul Scherrer Institut.

Professor Francesco Stellacci
EPFL, Switzerland

Francesco Stellacci is a full professor at the Ecole Polytechnique Federale de Lausanne (EPFL) in the Institute of Materials, the Bioengineering Institute, and in the Global Health Institute.

Broad Spectrum Antivirals

Viral infections are a great threat for modern society, there are thousands of people that die every year because of them (mostly in under-developed countries) and many more have a lower quality of life because of them. Furthermore, it is become apparent that pandemic infection can have enormous consequences on global health as well as on the economy of the entire world. In his talk Professor Stellacci will summarize a decade-long effort in his laboratory to develop broad-spectrum antivirals. The approach that will be presented is different from most biological approach as it is focused on an extracellular mechanism that affect the structural integrity of the virus rendering them non infective irreversibly. He will discuss the development of the compounds that we are investigating and their putative mechanism. In vitro, ex vivo, and in vivo example of the efficacy of such compounds will be discussed.

Professor Tess Lambe
Oxford Vaccine Group, University of Oxford, UK

Teresa Lambe is a Professor of Vaccinology & Immunology and the Calleva Head of Vaccine Immunology in the Oxford Vaccine Group at the University of Oxford. Professor Lambe is one of the principal investigators overseeing the Oxford/AstraZeneca vaccine programme. ChAdOx1 nCoV-19 has been distributed for vaccination in more than 180 countries with more than 3 billion does released and an estimated 6 million lives saved in 2021 alone.

Lessons learnt from COVID-19 vaccine development

Professor Lambe will speak about the Oxford/AstraZeneca vaccine journey from concept to delivery and the lessons learnt from this collaborative and interdisciplinary programme resulting in a vaccine which has played a pivotal role in the fight against COVID-19.

Meeting day 2 - Friday 16 June 2023

Plenary talk

Professor Sir Mark Walport FRCP FMedSci HonFRSE FRS

Imperial College Health Partners, UK

Sir Mark Walport is Foreign Secretary and Vice President, the Royal Society. He chairs Imperial College Health Partners, Imperial College Academic Health Sciences Centre and the Kennedy Memorial Trust. He is a non-executive board member of NHS England, and trustee of the British Museum, the Daiwa Anglo-Japanese Foundation, and Health Data Research UK.

Previous career highlights include:
Founding Chief Executive of UK Research and Innovation 2017 to 2020
Government Chief Scientific Adviser 2013 to 2017
Member and latterly co-chair of the Prime Minister's Council for Science and Technology
Director of the Wellcome Trust
Professor and Head of the Division of Medicine, Imperial College London
Founder Fellow and first Registrar of the Academy of Medical Sciences
Member of the Advisory Board of Infrastructure UK

The Challenge of Pandemic Preparedness

Meeting day 2 – Friday 16 June 2023

Net Zero

Session 5: Catalysts and small molecule activation

Co-chair: Professor Bill David FRS
STFC / University of Oxford

Professor Andrew Beale
University College London, UK

Andrew Beale is a Professor of Inorganic Chemistry at University College London (UCL), group leader at the Research Complex at Harwell, Chief Scientific Officer of Finden Ltd. He was awarded a BSc from the University of Sussex in 1996 followed by a PhD at the Royal Institution of Great Britain/UCL in 2003. From 2009 he was an assistant professor in the Department of Inorganic Chemistry and Catalysis at Utrecht University in the Netherlands. Andy then returned to the UK and to UCL in 2013 as an EPSRC Early Career Fellow before being promoted for full professor in 2014. His interests lie in establishing structure-function relationships in materials, including catalytic solids and energy storage as a function of both time and space using X-ray & optical spectroscopic and scattering methods applied under in situ and operando conditions.

Operando X-ray Spectroscopy & Scattering Measurements of Catalysts Used in Small Molecule Reduction

Metal ions & nanoparticles supported on mixed oxide supports have been shown to be very efficient for the conversion of small molecules such as CO, CO_2 & NO using reductants such as H2 and NH3. In this work his group show how XAS & XRD can be used to identify the active state of the metal species under reaction conditions with a view to exploiting this information to improve their performance.

Professor Murielle Delley
University of Basel, Switzerland

Murielle Delley is Assistant Professor of Inorganic Chemistry at the University of Basel in Switzerland. Together with her research group she focuses on the interfacial chemistry and catalysis of inorganic materials. Murielle Delley previously obtained her PhD in surface organometallic chemistry from the ETH Zurich with Professor Christophe Copéret in 2017, and then worked as a postdoc with Professor James M. Mayer at Yale on interfacial proton and electron transfers. She started her independent research in 2020 with SNSF PRIMA and Branco Weiss Society in science fellowships, and later also received a SNSF Starting Grant. In 2022, she was appointed assistant professor with tenure-track at the University of Basel.

Catalysis By Inorganic Materials: Control At The Surface By Tailored Interfaces And Electric Fields

Heterogeneous catalysis is essential to most industrial chemical processes. However, these processes are often not efficient or selective enough, and typically use rare and expensive noble metals as catalysts. Improving the sustainability of current processes will rely on the development of new controls in catalysis and of abundant materials as catalysts. Earth-abundant transition metal phosphides and sulphides have recently emerged as promising materials in some catalytic applications, such as hydrotreating and water splitting. This highlights the catalytic potential of transition metal phosphides and sulphides, but this potential has not been exploited much yet. New discoveries are hampered by a limited understanding of the interfacial chemistry that governs the catalytic properties of these materials. This talk will discuss the current efforts in expanding the catalytic universe of the earth-abundant transition metal phosphides and sulphides, and in developing new control elements at the surface based on chemical modification and electric fields to tune catalytic properties. The critical role of synchrotron-based characterization techniques in these efforts will be discussed.

Session 6: Next generation batteries and the need for spatial resolution for catalysis

Co-chair: Professor Christophe Copéret
ETH Zurich, Switzerland

Dr Kostiantyn Kravchyk
Empa/ETH Zurich Switzerland

Kostiantyn Kravchyk, born in 1982, grew up in Ukraine (Bukovina region). He studied chemistry at Chernivtsi National University and then continued his studies at Vernadsky Institute of General and Inorganic Chemistry of the Ukrainian National Academy of Sciences (PhD in 2008 with Professor Dr Anatolii G Belous; thesis topic: nanocrystalline oxygen-conductive materials based on doped-ZrO2). Subsequently, he completed postdoctoral research at University of Le Mans (France), University of Nantes (France), and ETH Zurich and Empa (Swiss Federal Laboratories for Materials Science and Technology). He now works as a senior scientist at Empa and ETH Zurich in the Functional Inorganic Materials group of Professor Maksym Kovalenko. His research interests include novel concepts for electrochemical energy storage and novel materials for Li-ion and post-Li-ion rechargeable batteries.

Pyrochlore Iron (III) hydroxyl fluoride as Low-Cost Lithium-Ion Cathode Material for Stationary Energy Storage

The shift from fossil fuels to CO_2-emission-free renewables such as solar and wind is impeded substantially by the absence of inexpensive stationary rechargeable batteries, which are required for stabilizing the energy production–consumption misbalance because of the intermittent characteristic of renewable energy sources. As a first approximation, the economic viability of stationary batteries can be assessed by comparing the capital costs of new systems to those of traditional pumped hydroelectric storage (0.1–1.4 ¢ kW−1 h−1 cycle−1), which is presently the predominant technology. Therefore, the stringent cost requirements can be satisfied only when a battery is composed entirely of low-cost, earth-abundant, and

convenient-to-produce constituents. In this context, his team report on iron (III) hydroxy fluoride with pyrochlore type structure as a compelling low-cost cathode material for lithium-ion batteries. It has a theoretical capacity of 257 mAh g-1 for one-electron operation and high lithiation voltage of ca. 3 V vs. Li+/Li. The talk will focus on the characterizing of iron (III) hydroxy fluoride using synchrotron X-ray diffraction and X-ray absorption spectroscopy.

Dr Peter P Wells
University of Southampton, UK

Peter Wells joined the University of Southampton in August 2016 as lecturer of Inorganic Chemistry, a joint appointment with Diamond Light Source, and was promoted to associate professor in March 2019. Before for taking up this role, Peter worked for University College London, and was based full time at the Research Complex at Harwell (RCaH) establishing a new national catalysis initiative, the EPSRC UK Catalysis Hub. Prior to this, Peter obtained a MChem in Chemistry (University of Surrey, 2003), a PhD in the preparation and characterisation of tailored metal nanoparticles, (University of Southampton, 2007), and was senior Research Fellow, working for Professor John Evans (University of Southampton, 2007-2011).

Spatially resolved methods for operando spectroscopy

The development of ever more efficient catalysts – essential as we transition to a net-zero carbon future – has, in recent years, drawn heavily on observing catalyst materials under operating conditions (operando) using advanced characterisation methods. However, contemporary studies have shown the limitations of the conventional operando approach; a ‘single point’ analysis fails to represent the multitude of conditions experienced along a catalyst bed, a consequence of both temperature and reactant/product concentration gradients as a result of catalytic processes. This presentation will cover recent advances in spatially resolved spectroscopic methods, principally involving synchrotron radiation techniques. and demonstrate the rich information it provides.

Session 7: Neutrons and X-rays

Co-chair: Professor Sir Richard Catlow FRS
Cardiff University/University College London, UK

Dr Victoria Garcia Sakai
ISIS Pulsed Neutron and Muon Source, UK

Vicky is Division Head for Neutron Spectroscopy at the ISIS Neutron and Muon Facility. She has been actively involved with neutron scattering facilities in different capacities, for the last 20 years. A chemical engineer from Imperial College London, she moved into the field of neutron scattering during her postdoc at Penn State University, USA.

Vicky is an internationally recognized expert in quasi-elastic neutron scattering applied to soft matter and biological systems. She is the editor of Dynamics of Soft Matter book (2012) and

published over 130 peer-review papers in the field. Vicky has experience directing, managing and advising on instrumentation and science user programmes. She sits on a number of high-level scientific and instrumentation advisory bodies to neutron facilities around the world, including currently serving as Chair of the European Spallation Source Science Advisory Council. She is also STFC liaison officer for the UK's synchrotron, Diamond Light Source, and is managing the bid for the Diamond II upgrade for STFC. Vicky has a passion for educating, with over 10 years' experience training students and postdocs in neutron techniques. She is the Director of the prestigious Oxford School of Neutron Scattering since 2015.

Neutron Spectroscopy as a tool to solving some of today's societal challenges

Neutron spectroscopy, in particular Quasi-Elastic Neutron Scattering and Neutron Vibrational Spectroscopy play an important role in providing key information to answer a wide range of scientific problems that face our society today. In particular, its role in materials research, catalysis, climate change and cleaner energy systems, but also in understanding biology and tackling disease. Advances in technology and experimental methods and the partnership with simulations, continue to invigorate the role neutron spectroscopy plays. The trend is for samples in the neutron beam to be more realistic and often more complex, which translates into facilities having to adapt their services to match the requirements of the user community. In this talk Dr Sakai will provide examples of science and applications that showcase the role of neutrons and discuss plans for the future.

Professor Matthias Arenz

University of Bern, Switzerland

Matthias Arenz studied physics and chemistry (minor) at the University of Bonn, Germany. During his PhD at the Institute of Physical Chemistry in Bonn, he stayed for 7 months at the Lawrence Berkeley National Laboratory, USA. After finishing his PhD, he returned to Berkeley for 2 years with a Feodor Lynen Fellowship of the German Humboldt Foundation. He then started his independent research group at the TU-Munich, Germany in 2006. After staying as associate professor at the University of Copenhagen, Denmark, from 2010-2016, in 2016 he accepted a full professorship at the University of Bern, Switzerland.

His area of work is electrocatalytic processes for renewable energy conversion.

In situ and operando studies in electrocatalysis

He will present selected examples of studies of electrocatalytic processes as well as catalyst synthesis. In the first part he will present an in situ study of the formation of a high entropy alloy electrocatalyst studied by XRD and XAS. In the second part, studies concerning the degradation of fuel cell catalysts.

Session 8: Looking across scales

Co-chair: Dr Maarten Nachtegaal
Paul Scherrer Institut, Switzerland

Professor Raffaella Buonsanti
EPFL, Switzerland

Rafaella Buonsanti is associate professor in the Department of Chemical Sciences and Engineering at EPFL working on nanoscience, material chemistry, electrocatalysis, energy conversion and using synchrotron science to characterize our materials and their changes during operation.

Colloidal chemistry to advance catalysis and energy technologies

Affordable clean energy and climate action are two of the sustainable development goals set by the United Nations to be achieved by 2030. The vast majority of energy technologies relies on nanomaterials and their progress is strongly connected to the ability of materials chemists to tune their property and function-dictating features. In this talk, Professor Buonsanti will present her groups recent efforts towards the synthesis of atomically defined nanocrystals via colloidal chemistry. She will showcase how nanocrystals with precisely tuneable shapes, sizes and interfaces serve as ideal platforms to advance our current knowledge towards improved selectivity in the electrochemical CO_2 reduction reaction. She will also discuss her teams work on a new class of hybrid organic/inorganic materials synthesized by colloidal atomic layer depositions which provide solutions for efficient light converting devices and for stabilizing electrocatalysts during operation.

Dr Alexander O'Malley
University of Bath, UK

Dr O'Malley received his PhD in 2016 from University College London part sponsored by the ISIS Neutron Source and based at the UK Catalysis Hub supervised by Professor Richard Catlow. He carried out postdoctoral research at Cardiff University in the group of Professor Nora De Leeuw, and in 2017 began a Ramsay Memorial Fellowship at Cardiff University. In 2018 he was offered a Whorrod Fellowship in Sustainable Chemical Technologies at the University of Bath where he will begin as lecturer/assistant professor in September 2023. His research to date has predominantly employed neutron scattering and molecular modelling methods to probe the behaviour of molecules adsorbed in porous materials for the purposes of catalysis, drug delivery and decontamination technologies.

Neutron spectroscopy studies of molecular behaviour in microporous catalysts

The combination of neutron spectroscopy techniques and molecular modelling (both quantum mechanical and classical) has allowed us to obtain unique insight into the dynamical behaviour of molecules confined in microporous catalysts. Processes significant for achieving Net Zero such as the zeolite mediated conversion of methanol to hydrocarbons/olefins (MTH/O) and

the conversion of lignocellulosic biomass to useful chemicals will require such insight if they are to be optimised, remain commercially viable, and enable a transition from fossil fuel feedstocks. The talk will outline some recent studies where combined neutron spectroscopic and modelling techniques have characterised and quantified the motion of the active species in the aforementioned processes - including methanol, dimethyl ether, phenols and cresols - in commercial zeolite catalysts with varying framework structures and compositions.

Meeting day 2 – Friday 16 June 2023

Pandemic Preparedness

Session 5: Understanding disease and the virus host interface

Co-chair: Professor Adriano Aguzzi MD
Institut für Neuropathologie, Switzerland

Dr Claire Smith
University College London, UK

Claire is an associate professor at UCL Great Ormand Street Institute (GOS) of Child Health specializing in primary human epithelial respiratory virus infection models, including respiratory syncytial virus influenza virus, and SARS-CoV-2. These models recapitulate the characteristics of the donor regarding ie, disease status (asthma, cystic fibrosis) and age, to name a few. Claire uses these specialised models to elucidate mechanisms of the very earliest time points of infection. Her work in this field has been funded by UK Research and Innovation, Animal Free Research UK, Great Ormond Street Hospital Children's Charity and the Wellcome Trust. In addition to her research activities, Claire manages a research tissue bank at UCL GOS Institute of Child Health, which facilitates the supply of primary respiratory material to projects focused on respiratory infection and diseases.

Revealing Age-Associated Differences in SARS-CoV-2 Infection using Nasal Epithelial Cell Cultures

During her presentation, Claire will discuss the importance of utilizing physiologically relevant models to replicate the pathology of COVID-19 infection. She will focus on the air-liquid interface culture platform, a type of model that can be generated from cells donated by anyone and can simulate a wide range of COVID-19 severity-associated human phenotypes. Claire has conducted a comprehensive study using this model to investigate how cells from different age groups respond to SARS-CoV-2 infection. Her multidisciplinary approach has revealed that nasal epithelial cells exhibit different virus tropism depending on age and expression of ACE2 and TMPRSS2. Ciliated cells serve as a viral replication centre across all age groups, but a distinct inflammatory subtype emerges in infected paediatric cultures with high expression of interferon-stimulated genes and truncated viral genomes. On the other hand, infected elderly cultures show an increase in ITGB6hi progenitors, which can facilitate viral spread and possess a gene signature associated with dysfunctional epithelial repair pathways and fibrosis.

Dr Joep Beumer
Roche, Switzerland

Dr Joep Beumer completed his PhD studies in the lab of Hans Clevers in the Hubrecht Institute in 2020, The Netherlands. He developed multiple organoid platforms, including a system derived from snake venom glands, and used these to understand lineage specification of different epithelial cell types. He improved CRISPR-based genetic engineering approaches in

organoids that enabled the study of putative coronavirus host factors. After a postdoctoral period in the Clevers' lab, Beumer started his own research group at the Institute of Human Biology, Roche, to develop next-generation adult stem cell-derived organoid models. His team focuses on the development of automated genome-engineering approaches in organoids to build complex isogenic human disease models and confer synthetic features to cells.

Human adult stem cell-derived organoids to model viral infection and essential host factors

Organoids derived from adult stem cells retain most features of the source tissue, including cellular heterogeneity and genetic stability. Human intestinal organoids (IOs) are increasingly used to model human disease and are amenable to most genetic engineering techniques. Dr Beumer and his team have employed IOs to evidence the ability of SARS-CoV-2 to replicate in the human gut. They used IOs combined with transcriptomics to model the epithelial response to the virus and assess its cellular tropism. They applied CRISPR-Cas9 genetically engineered IOs to study the role of putative host factors in viral replication, as well as the regulation of these genes using fluorescent reporters. These findings could evaluate host factors as drug targets and identify novel regulators of their expression.

Session 6: The immune response to infection

Co-chair: Professor Sir David Stuart FRS
Oxford University/ Diamond Light Source, UK

Professor Adriano Aguzzi MD
Institut für Neuropathologie, Switzerland

Arrayed high-throughput serology and forward genetics

Pandemic preparedness requires the rapid deployment of large-scale assays. Professor Aguzzi's laboratory has developed two technologies towards that goal. Firstly, they have established a pipeline for high-throughput, highly automated serology in ultra-high-density 1536-well plates. Liquid dispensing is performed using acoustic dispensers and microdrop instrumentation; each assay is conducted in a total volume of three microliters. The facility is contained within a biosafety level-2 cabinet. Furthermore, they have established arrayed libraries for genetic perturbation (gene deletion, gene activation, and epigenetic silencing by promoter methylation). These libraries encompass over 42,000 individually indexed plasmids for expression of lentiviral sgRNA constructs. These resources allow for the rapid interrogation of complex phenotypes in an arrayed fashion, thereby enabling the complete enumeration of host factors responsible for virus-related phenotypes (eg viral entry, viral replication, cytopathology, and host-cell defenses) within a time frame of a few weeks.

Professor Gavin Screaton
University of Oxford, UK

Professor Gavin Screaton is Professor of Medicine and Head of the Medical Sciences Division, University of Oxford. Professor Screaton received his first degree from Cambridge in 1984 before moving to Oxford to complete his medical studies in 1987. He then completed training in general internal medicine and obtained a DPhil from Oxford University in 1998. In 2004, he was appointed to the Chair of medicine at Hammersmith Hospital, Imperial College and became Dean of the Faculty of Medicine in 2015. He returned to Oxford as Head of the Medical Sciences Division in October 2017. His research, supported by a series of Fellowships awarded by the MRC and Wellcome Trust, has covered topics from control of RNA processing and apoptosis to immunology. The current interests of his laboratory revolve around the immunology of infectious diseases with a special interest in dengue haemorrhagic fever and Zika, where his research is currently funded by the Wellcome Trust, with active research collaborations in South-East Asia. His laboratory has recently contributed to knowledge of the antibody response to SARS-CoV-2. Professor Screaton is a Fellow of the Academy of Medical Sciences, a Fellow of the Royal College of Physicians, and was made a founder senior investigator in the National Institute for Health Research. He is a non-executive director of Oxford University Hospitals NHS Foundation Trust.

Antibody responses to SARS-CoV-2

Professor Gavin Screaton's laboratory has studied the neutralizing antibody to SARS-CoV-2 using either polyclonal serum or through the generation of large panels of monoclonal antibodies from volunteers infected with a number of variants. Highly potent neutralizing antibodies are generated following infection/vaccination and most of these target the receptor binding domain at the tip of the spike protein and function by inhibiting interaction with ACE2. The rapid evolution of spike in a succession of variants targets sites of binding of potent monoclonals. So rapid is the evolution that the activity of the majority of a panel of mAb produced after BA.4/5 is knocked out to currently circulating XBB variants.

Session 7: Cellular virology: Understanding the cellular life of viruses in host cells

Co-chair: Professor Marco Stampanoni
Paul Scherrer Institut and ETH Zurich, Switzerland

Professor Wendy Barclay
Imperial College London, UK

Host barriers to the emergence of influenza pandemics

Influenza pandemics arise when influenza A viruses with novel antigenicity cross from the natural avian reservoir to humans. The frequency of these events is limited by the incompatibility between avian influenza viruses and mammalian hosts, because the host

factors the virus relies on, or those that inhibit it, can differ between species. For example, the un-adapted avian influenza virus polymerase enzyme is poorly active in mammalian cells. This is explained by a difference in the host protein ANP32A which influenza virus subverts as a polymerase cofactor. Mutations in the viral polymerase can adapt the virus for efficient mammalian replication and such mutations are observed in all pandemic and seasonal influenza viruses and most zoonotic infections. Identifying such host factors and their mechanisms can improve our ability to risk assess the myriad of animal influenza viruses, serving to focus our efforts on those with greatest zoonotic or pandemic potential, and may also provide novel routes for intervention.

Professor Francisco Mesquita
EPFL Lausanne, Switzerland

Francisco joined the lab of Professor Gisou van der Goot at EPFL as a senior scientist in late 2018. He has a long-standing interest in cellular microbiology, with a “more recent” focus on the role of host lipid metabolism and lipid post-translational modifications in viral membrane biology. For postdoc, Francisco joined the group of Didier Cabanes (i3S, Portugal) with an EMBO Long-term Fellowship (2013) after a year-long career break. He studied host responses to bacterial pore-forming toxins and Listeria, developing zebrafish embryos, as models for in vivo investigation of Listeria infection. Francisco completed his PhD (2006-2011) in the group of Professor David Holden (CMBI-Imperial College London, UK) studying Salmonella interactions with autophagy and innate immunity. He was trained in Medical Microbiology (MSc - Lisbon Nova University) and Microbiology (BSc - Biotechnology School - Portuguese Catholic University).

Why Lipids and Lipid Modifications are central for the biology of enveloped viruses?

RNA-enveloped viruses have their cellular life cycles and pathogenicity intimately linked to host lipid pathways and lipid post-translational modifications. S-acylation is the reversible attachment of fatty acids to proteins, modifying ≈20% of the human genome and numerous proteins from important viral pathogens. They found that this reversible modification is exploited by SARS-CoV-2 to control different stages of the viral life cycle. They have identified the host enzymes that modify multiple viral components and in particular, shown that acylation of the Spike fusion protein ensures its biogenesis and maintains the lipid organization and composition of viral envelopes. In addition, they found that infection regulates the expression of host acylation enzymes through an uncharacterized transcriptional shift that is exploited by SARS-CoV-2 to optimize acylation of the viral fusion glycoprotein spike leading to the production of virions with increased infectivity. He will discuss how this emerging link between Coronaviruses and S-acylation, provides a great model to discover the molecular mechanisms required for viral infections but also, an exquisite tool to study fundamental host cell processes at the host-virus interface.

Session 8: The role of large research infrastructure in pandemic preparedness

Co-chair: Professor Wendy Barclay
Imperial College London, UK

Professor Marco Stampanoni
Paul Scherrer Institut and ETH Zurich, Switzerland

Leveraging Large Research Infrastructure for Pandemic Preparedness: Advancing Understanding and Interventions through Tomographic Imaging and Protein Crystallography - the SLS experience

Large research infrastructures play a critical role in pandemic preparedness by providing advanced tools and resources to combat emerging infectious diseases. Here they highlight the indispensable contributions of tomographic imaging and protein crystallography, two powerful techniques, in advancing our understanding of pandemics and enabling targeted interventions.

Tomographic imaging techniques, including synchrotron tomography and electron microscopy, offer high-resolution three-dimensional visualization of pathogen-host interactions. By elucidating the spatial organization, dynamics, and tissue damage associated with infectious diseases, tomographic imaging informs the identification of therapeutic targets and the design of novel antiviral agents.

Protein crystallography, another crucial tool, facilitates the determination of atomic-level structures of proteins involved in viral entry, replication, and immune evasion. This molecular-level understanding is key to developing antiviral drugs and vaccines, as well as optimizing drug candidates and understanding drug resistance mechanisms.

High-quality multi-scale imaging technologies, ranging from molecular level with near-atomic resolution to tissue imaging is essential: large research infrastructures, encompassing synchrotron radiation facilities with dedicated imaging and crystallography beamlines, provide scientists with state-of-the-art instruments and collaborative research environments. Rapid and responsive access to these facilities enables interdisciplinary collaborations, high-throughput experiments, and expert support, accelerating the pace of discovery and innovation in pandemic preparedness.

In conclusion, large research infrastructures did significantly enhance our understanding of pandemic pathogens and support the development of targeted interventions. By leveraging these advanced techniques and resources, we strengthen our ability to respond rapidly and effectively to emerging infectious threats.

Professor Frank von Delft
University of Oxford, UK

Panel discussion

Co-chair: Professor Sir Richard Catlow FRS
Cardiff University/University College London, UK

Professor Raffaella Buonsanti
EPFL, Switzerland

Dr Philip King
Science and Technology Facilities Council (STFC) / ISIS Neutron & Muon Source

Philip is Associate Director for Partnerships and Programmes at the ISIS Neutron & Muon Source, with responsibility for UK and international partnerships, the user programme and other areas. He was previously a science division head at the facility following being Muon group leader.

Sebastian Laurent-Powers
STFC, UK

Sebastian is International Strategy Manager at the Science and Technology Facilities Council with responsibility for coordinating STFC's International Science Partnerships Fund programmes and analysis of STFC's international activities. He was previously International Officer for Europe and the UK NCP for the research infrastructure programme under Horizon 2020.

Professor Thomas Schmidt
Paul Scherrer Institute, Switzerland

Professor Sir David Stuart FRS
Oxford University/ Diamond Light Source, UK

Closing remarks

Professor Sir Richard Catlow FRS
Cardiff University/University College London, UK

Dr Marc Türler
Swiss Academy of Sciences (SCNAT), Switzerland

Meeting attendees

Dr Gregor Cicchetti
Paul Scherrer Institut, Switzerland

Gregor Cicchetti has a research background in microbiology and cell biology. He received his PhD at the University of Cologne (Germany) and was a postdoctoral fellow at Harvard University, where he investigated actin-based dynamic processes. He then gained extensive experience in the publishing industry where he was responsible in different roles for scientific journals and books programs. Since 2014 he is working at the Paul Scherrer Institute at the division of Biology and Chemistry as Scientific Relations Manager where he participates in the implementation of the strategy of the division and serves as an interface for internal and external partners. In this role he supports the division head and the directorial board of PSI in defining strategies of the institute. In addition, he is involved in science communication, and he represents PSI in open science initiatives.

Dr Christian Rüegg
Paul Scherrer Institut, Switzerland

Professor Dr Christian Rüegg is Director of the Paul Scherrer Institut (PSI) and full professor of physics in a joint chair of ETH Zurich and EPF Lausanne and professor at the University of Geneva. Since June 2022 he is member of the ETH Board and representative of the four Research Institutes (PSI, Empa, WSL, Eawag). Coming from the canton of Aargau, Rüegg studied physics at ETH Zurich and obtained his doctorate in 2005 at the Laboratory for Neutron Scattering at ETH Zurich and PSI. He then worked at the London Centre for Nanotechnology at University College London from 2005 to 2011. He was a Royal Society University Research Fellow and assistant and associate professor at UCL. Between 2011 and 2016 he headed the Laboratory for Neutron Scattering and Imaging in the Research Division Neutrons and Muons at PSI. From 2017 to 2020 he was Head of the Research Division and since May 2018 member of the PSI Directorate. Rüegg is a solid-state physicist and works on quantum phenomena in magnetism. He has received prestigious science awards for his work, including the Lewy Bertaut Prize and the Nicholas Kurti European Science Prize, as well as an ERC Grant. He played a decisive role in the use and further development of the instrumentation at the Swiss Spallation Neutron Source SINQ and at the European sources Institut Laue-Langevin and European Spallation Source and represents this field of research in numerous international committees.

Dr Marc Türler
Swiss Academy of Sciences (SCNAT), Switzerland

Rapporteurs

Dr Terri-Louise Hughes
ISIS - STFC, UK

Terri-Louise joined ISIS in 2022 as a SANDALS instrument scientist, with a background in chemistry and catalysis. She completed her PhD at the University of Manchester in 2021 within the porous materials and catalysis research group, during which she used operando nuclear magnetic resonance and total neutron scattering on NIMROD to study heterogeneously catalysed reactions and confined liquid mixtures. The unique use of this combination of techniques enabled structure-reactivity links to be probed via extensive use of EPSR to model the systems.

Dr Anna Warren
Diamond Light Source, UK

Anna is a senior beamline scientist working on the Versatile Macromolecular Crystallography Microfocus (VMXm) beamline at Diamond Light Source. Anna's research focuses on method and technique development related directly to the use of microfocus beamlines for protein crystallography. Prior to working on VMXm, Anna was a postdoctoral research associate on I24, and a Support Scientist on I19, the small molecule crystallography beamline at Diamond. Anna completed her PhD in 2011 under the supervision on Professor Paul Raithby at the University of Bath.