

Bristol Scientific Club: Programme of Meetings 2016-2017

(1) Friday, 23 September 2016

Guest Speaker: Carolyn Morton: "The Scientific Detective"

How does science help to solve crimes and produce evidence for court? Is it all "cut and dried"? Fingerprinting and DNA – do they prove someone's identity? These and related topics will be considered in a guide to the huge potential and also limitations of forensic science in the real world – as opposed to TV dramas!

Dr Carolyn Morton is Learning & Teaching Fellow and Senior Lecturer in Forensic Science at the University of the West of England. Her areas of interests include Forensic Science, Forensic Chemistry and Toxicology, Interpretation and Communication of Forensic Scientific Evidence, Crime Scene Investigation Training.

(2) Saturday, 22 October 2016

Guest Speaker: Wuge Briscoe: "Nature's secret lubricants"

The subject of friction and lubrication is as relevant today – due to ever increasing surface-to-volume ratio in nanotechnolgoy, as it was in antiquity – e.g. when ancient Egyptians transported stone statues. The remarkable ease with which some biological tissue surfaces glide over each other has long puzzled physicists studying friction and humbled engineers lubricating mechanical components. Our fundamental understanding of the enigmatic mechanism for biolubrication remains limited.

We have performed measurements using a technique called the surface force apparatus (SFA) to critically examine two biolubrication mechanisms, focusing on the possible roles of lipids and biomacromolecules in facilitating biolubrication. We propose a hydration lubrication mechanism that points to the fluidity of water molecules under confinement as a unifying physical property responsible for the effective lubrication observed in nature.

Dr Wuge Briscoe is Senior Lecturer in Physical Chemistry at the University of Bristol's School of Chemistry. His research interests include direct measurement of surface forces mediated by surfactants, polymers and nanofluids, and fundamental aspects of biolubrication and nanotoxicity.

(3) Saturday, 19 November 2016

Speaker: Tony Pipe: "The Driverless Car Revolution: coming to a driveway near you!"

There is a great deal of activity in this area, associated with the technology itself, but also with the issues of user-acceptance, insurance, legal, and even ownership changes that may accompany the introduction of autonomous road and pavement ground vehicles into our societies. Prof. Tony Pipe is involved with two Innovate UK funded projects in this area, which are especially targeted at these areas listed above. In the presentation, Tony will discuss these factors and their potential impacts on us over the next few decades; taken together they *do* give a feeling akin to a kind of 'revolution' in the way we may conduct our lives in the future.

Tony Pipe is Professor of Robotics and Autonomous Systems at the University of the West of England and Deputy Director of the Bristol Robotics Laboratory.

His research foci are: innovative medical technology, safe physical Human Robot Interaction for robots co-located with humans; modelling animal brain signal processing and control structures; self-healing VLSI electronic hardware for safety-critical applications.

(4) Friday, 10 February 2017

Guest Speaker : Richard Pancost: “How Earth’s History Reveals Climate Change Risks”

Anthropogenic climate disruption is a risk – to lives, our economy, our food supply and our infrastructure. But what type of risk is it? Mark Carney, Governor of the Bank of England, has described it as a systemic risk to global financial structures; others refer to it as an existential risk, invoking apocalyptic images and concerns about planetary or human extinction; and yet others consider it a manageable risk, subordinate to greater security concerns. Consideration of past climates can provide insight into these issues. Although they do not consider the human or societal component of how climate change will impact us, Earth history does allow us to put contemporary climate change in context. For example, it is not unprecedented in magnitude but it is in terms of rate. Warmer worlds are habitable but they are also markedly different. In this talk, I will focus on how we extract these climate lessons from the geological record and then evaluate them in the context of contemporary framings of the climate change challenge.

Richard Pancost is Director of the University of Bristol Cabot Institute, Professor of Biogeochemistry and Royal Society Wolfson Research Merit Scholar at the University of Bristol’s School of Chemistry Organic Geochemistry Unit. His research interests include molecular and isotopic proxies for biogeochemical processes in modern and ancient sediments.

(5) Saturday, 25 March 2017

Speaker: Roger Moses: “The Birth of Astroparticle Physics”

A century ago, the cosmic radiation was discovered, but it took the next fifty years to find out that it was a stream of high energy particles coming from somewhere in space, but the where and how of the mysterious sources remained hidden. Its link with astronomy was tenuous. Now we see that high energy particles are key in all areas of our knowledge about the universe. This lecture will examine the origins of the new discipline of Astroparticle Physics after WW2, its flowering and development since, based on particle physics discoveries in the ground based accelerator labs, and the new views of the universe afforded by spaceflight, and its place at the heart of astronomy today

Dr Roger Moses is Honorary Fellow in Aerospace Engineering at the University of Bristol, where he still lectures on space technology. He obtained a PhD in Cosmic Ray Physics and worked on balloon and satellite experiments on the Cosmic Radiation for 15 years before lecturing in Aerospace Engineering.

(6) Friday, 5 May 2017

Guest Speaker: Tom Scott: “Forensically Understanding Fukushima”

In March 2011, an earthquake and tsunami of unprecedented scale hit the eastern coast of Japan, exacting a deadly toll on coastal areas. The Fukushima Daiichi nuclear power plant (FDNPP) was severely stricken by the tsunami, and a catalogue of containment failures caused Units 1-4 to contaminate the environment with a significant atmospheric release of radioactive material by a variety of mechanisms that are yet not fully understood.

A fallout inventory of some 890 PBq of radiocaesium is estimated, with most of this material removed from the atmosphere by a combination of wet and dry deposition to contaminate a large area of land extending up to 200 km from the site. Currently, the chemical state, mobility and fate of the fallout material are poorly understood. It is well-recognised that the mobility of the principal components of the radiation for the next decades will be

determined by the transport of fine-grained particulates, especially pulses of redistribution via suspended sediments in river systems stimulated by periodic typhoon events.

But, it has been unclear as to exactly what the fallout contained in terms of radionuclides and their chemical speciation. This is a key question because modelling the remobilisation depends critically on the host material of all sources of radioactivity. The current talk presents new information relating to the characteristics of the Fukushima fallout collected from different areas within 30km of the site. Using advanced analytical techniques we demonstrate the presence of uranium in a selection of samples along with measurable Pu isotope anomalies, suggesting that some areas received fallout of spent fuel particulates.

Professor Tom Scott is Executive Co-Director of the Bristol-Oxford Nuclear Research Centre, Director of the Interface Analysis Centre and Royal Academy of Engineering Chair in Actinide Materials at the University of Bristol School of Physics. His principal area of research is the physio-chemical behaviour of uranium and its compounds – specialising in the oxidation/corrosion behaviour of uranium, and methods for its storage, processing and environmental remediation.