The Bristol Scientific Club Programme of Meetings for 2017 -2018

(1) Friday, 15 September 2017

Guest Speaker: Julie Dunne: "Prehistoric porridge? How small molecules from ancient pottery can tell us what people were eating in the past."

The invention of pottery, around 15,000 years ago, was one of the most significant technological advances in human history. Being able to determine what foodstuffs were cooked in early ceramics provides important information on the transition to an agricultural lifestyle, the domestication of plants and animals and the development of the lactase persistence allele. The technique of organic residue analysis is providing answers to these questions. Over the last twenty-five years, using a combined molecular and isotopic approach, we have been able to extract lipids, the fats, oils and waxes of the natural world, from pottery found across the globe. In this talk, I will focus on what we've learned about diet and subsistence practices in the enigmatic Holocene 'Green Saharan' Africa.

Dr Julie Dunne is a post-doctoral researcher in the Organic Geochemistry Unit at the University of Bristol. Her research interests include the use of molecular and isotopic proxies to investigate ancient diet and subsistence practices and their application in determining past environments.

(2) Saturday, 21 October 2017

Speaker: Michael Berry: "Chasing the silver dragon: tidal bores on the Severn and elsewhere"

When a gently widening river flows into an ocean, an incoming high tide can arrive as a breaking wave. Such tidal bores occur on rivers in many countries, in particular the Severn which has the second-highest tide in the world. This dramatic phenomenon, in which the river flows backwards, illustrates the first unification in physics: the same force – gravity – keeps us on the ground, holds the moon in its orbit, and pulls the tides.

Professor Sir Michael Berry, FRS is a theoretical physicist at the H H Wills Physics Laboratory, University of Bristol, where he has been for more than twice as long as he has not.

(3) Saturday, 2 December 2017

Guest Speaker: Stuart Whittington: "Random knots: from garden hoses to DNA"

Knots are ubiquitous in nature. Everyone is familiar with entangled garden hoses and extension cords and all long flexible objects are susceptible to these entanglements. The same thing happens at the molecular level and biopolymers such as proteins and DNA are frequently knotted. Knots in DNA can interfere with cellular processes such as replication and transcription. The talk will focus on understanding why long flexible objects are knotted with high probability and will examine the ways in which these entanglements affect replication and transcription, and how organisms cope with these problems.

Stu Whittington is an Emeritus Professor at University of Toronto and a Visiting Professor at University of Bristol. His research interests are in statistical mechanics and especially in problems with a topological flavour.

(4) Friday, 9 February 2018

Speaker: Alan Winfield: "From Robot Ethics to Ethical Robots"

Like any transformative technology, intelligent robotics has the potential for huge benefit, but is not without ethical or societal risk. In this lecture I will explore two questions:
Firstly, the increasingly urgent question of the ethical use of robots: are there particular applications of robots that should be proscribed, in eldercare, or surveillance, or war fighting for example? What are the ethical hazards associated with intelligent autonomous robots? I will refer to recent work on the new BS 8611 Guide to the ethical design and application of robots and robotic systems, and outline an ethical governance framework for robotics.
Secondly, I will consider the longer-term question of whether intelligent robots themselves could or should be ethical. Seventy years ago Isaac Asimov created his fictional Three Laws of Robotics. Is there now a realistic prospect

that we could build a robot that is Three Laws Safe and – even if we could – should we? I will report on current research on robots with simulation-based internal models, which suggests a route toward robots that are more than just safe, but also minimally ethical.

Alan Winfield is Professor of Electronic Engineering and Director of the Science Communication Unit in the Department of Engineering, Design and Mathematics (Faculty of Environment and Technology) at the University of the West of England. He conducts research in cognitive robotics within the Bristol Robotics Lab and is committed to the widest possible dissemination of research and ideas in science, engineering and technology.

(5) Saturday, 17 March 2018
Guest Speaker: Mervyn Miles: "Touching and Feeling the Nano World – A Tour de Force Microscopy"
The Nanoscience and Nanotechnology revolution was catalysed and accelerated by the invention of new microscopies capable of characterising structures at the nanoscale and beyond: these were scanning tunnelling microscopy (STM) and atomic force microscopy (AFM) in the 1980s.
Gerd Binnig and Heini Rohrer were awarded the 1986 Nobel Prize in Physics for the invention of STM, and Binnig, Christoph Gerber and Cal Quate were awarded the 21016 Kavli Prize in Nanoscience in recognition of their invention of AFM.
Nanoscience in the meantime had developed into a discipline in its own right. Christoph Gerber has been a regular visitor to Bristol Physics and we were honoured that Heini Rohrer agreed to officially open our Centre for Nanoscience and Quantum Information in 2010.
Atomic force microscopy has proven to be a wonderfully versatile technique It encompassed wide range of techniques based on various force interaction of an atomically sharp probe and the sample structure to be imaged. The resolution can be atomic and even subatomic, and it can image in 3D at high-resolution even in liquids, allowing biological processes to be followed at the submolecular scale. Some of these structures are very delicate, and AFM techniques in which the
probe can 'feel' the sample without 'touching' it are essential. Examples of extreme forcemicroscopy will be presented, including watching: molecular motors operating, amyloid molecules interfering with neuronal membranes in Alzheimer's Disease, and the distribution of electrons in an individual atom.

Professor Mervyn J. Miles, FRS, FInstP is Professor of Physics and Royal Society Wolfson Research Merit Award Holder at the University of Bristol HH Wills Physics Laboratory.
His research interests include: atomic force microscopy, scanning tunnelling microscopy, scanning near-field optical microscopy, high-speed AFM, high-speed non-contact AFM, holographic optical tweezer, optical AFM, polymers, biomolecules and biosensors.

(6) Friday, 20 April 2018
Speaker: Andrew Smith: "Nailsea Glassworks"
The talk is based broadly on a comprehensive study of the Nailsea Glassworks. It covers the history and development of the glassworks, from 1788 to its demise in 1874, principally from an archaeological viewpoint. Also considered are the technologies employed, and the social and economic aspects of the establishment of what in its day was a high-tech industry with very well paid skilled workers in a largely rural community, the lives of those workers themselves and the ubiquitous 'Nailsea Glass'. I will try to add a nod in the direction of the chemistry involved.

Andrew Smith is a Chartered Electrical Engineer who became an archaeologist via a one-year part-time 'A' level in Archaeology, followed by a one-year full-time taught master's degree in Landscape Archaeology at Bristol University. His part-time work for the Avon Archaeological Unit includes the Nailsea Glass study which is published both on the internet and commercially. Andrew has acted as a consultant for work on the site, which is still on-going and for several years was a visiting lecturer at the University of Bath for external MSc courses in Electrical Engineering.