
**EASTBIO Annual Symposium 2014**

**University of Dundee, 28-29 August 2014**

**Symposium plenary speakers**

**Abstracts & Short biographical notes**

**Professor J. Julian Blow**

**Symposium Welcome Address**

Julian is Professor of Chromosome Maintenance at the College of Life Sciences at the University of Dundee. Julian did his PhD from 1984-1988 with Ron Laskey at the University of Cambridge, where he worked on DNA replication in *Xenopus* egg extracts. From 1988-1991 he was a postdoc in Paul Nurse's lab in Oxford, working on the role of CDKs in DNA replication. In 1991 Julian set up his own research lab at the ICRF Clare Hall Laboratories and was promoted to Senior Scientist in 1996. In 1997 he moved to the University of Dundee and was appointed Professor in 2001. Julian's lab studies mechanisms ensuring the precise duplication of chromosomal DNA during the cell cycle. Recent work has addressed the response to replication inhibition and the activation of dormant replication origins as a means to ensure that the genome is completely replicated. Julian is a Member of EMBO (2001), a Fellow of the Royal Society of Edinburgh (2002) and a Fellow of the Academy of Medical Sciences (2012). From 2012-2014 he was Director of the Centre for Gene Regulation and Expression and has recently been appointed Dean of Research for the College of Life Sciences in Dundee.

**Professor Doreen Cantrell**

**"Exploits of an unreliable student"**

"Exploits of an unreliable student" is a description of a personal journey from student to scientist with organisational responsibilities, discussing the motivations and realities of scientific research and the somewhat unpredictable directions it can take you in. It will include some of speaker's science on the way.

**Doreen Cantrell** is a Wellcome Trust Principal Research Fellow, Head of the College of Life Sciences and Vice Principal of the University of Dundee. Her research interests are focused on T lymphocyte development and activation, a key process to the comprehension and manipulation of mammalian immune responses. She has published over 170 research papers and was elected a Fellow of the Academy of Medical Sciences and EMBO in 2000, a Fellow of the Royal Society of Edinburgh in 2005 and a Fellow of the Royal Society in 2011. She was awarded Commander of the British Empire in the 2014 New Year Honours.

**Professor Keith Lindsey**

**"Genetic and hormonal control of root meritem function"**

The patterning and maintenance of the root meristem in Arabidopsis is the consequence of interactions between hormones and overlapping transcription factors. Radial pattern is established by interactions between SCARECROW (SCR) and SHORT-ROOT (SHR), both members of the GRAS transcription factor family. Both SCR and SHR proteins are also found in the quiescent centre (QC), a group of slowly dividing cells in the meristem that play a critical role in maintaining the undifferentiated state of the surrounding stem cells. The distribution of auxin by the AUX1 and PIN proteins is essential to maintain pattern. The transcription factors PLETHORA1 and 2 (PLT1 and 2) are activated by auxin in the QC and in the surrounding stem cell niche, overlapping with SCR and SHR. *plt1 plt2* double mutants cannot specify the QC and so cannot maintain stem cell identity. This is consistent with a model for a combinatorial role for these transcription factors in controlling stem cell identity and activity in the root meristem, and in response to auxin. Here I will describe our approaches to identify and characterise other genes involved in both the correct patterning of the embryo and root meristem and also maintenance of meristem activity, through effects on auxin signalling.

**Keith Lindsey** is Professor of Plant Molecular Biology and Head of School at Durham University's School of Biological & Biomedical Sciences. His research interests are in understanding molecular mechanisms of plant development. A graduate of Oxford and Edinburgh Universities, he carried out post-doctoral research at Edinburgh's Department of Botany and at the Department of Biochemistry at Rothamsted Experimental Station. He was appointed to an academic faculty post at the University of Leicester in 1989, before moving to a Chair in Durham in 1996. He was Head of the School of Biological and Biomedical Sciences at Durham from 1997–2000, before taking this role on for a second time in 2013. He is Chair of the *New Phytologist Trust*, and until recently was President and Chair of Council of the *Society for Experimental Biology*, a member of BBSRC Council (BBSRC's governing body), and of the UK Government *Advisory Committee on Releases to the Environment* (ACRE, which advises government Ministers on GM-related issues). He is a Fellow of the Society of Biology.

**Professor Frank Sargent**

**"Hydrogenases: metalloenzymes of the past and of the future"**

Hydrogen holds a special place in future energy technologies since its requirement in so many industrial processes extends greatly beyond its direct use as a clean fuel. Biohydrogen offers the prospect of fully renewable hydrogen, freed from dependence on fossil fuel. Hydrogen biochemistry has a critical place in the metabolism of many microbes, and equally important is hydrogen oxidation, where it is predominantly used as a respiratory electron donor in central energy metabolism. Indeed, in bacterial pathogens respiratory hydrogen oxidation is central to the infection process. Hydrogenases are among the most active of redox enzymes and the two main classes, [FeFe] and [NiFe], are named according to the metals in the active site. The model bacterium Escherichia coli contains only [NiFe] hydrogenases and our research focuses on understanding the biology and chemistry of the three isoenzymes present. Hyd-1 is an oxygen-tolerant enzyme; Hyd-2 is a bidirectional catalyst with biotechnological applications; and Hyd-3 is part of the formate hydrogenlyase complex, which is an ancient progenitor of Complex I and arguably central to the evolution of cellular life.

**Frank Sargent** is the Chair of Bacterial Physiology in the College of Life Sciences. He was brought up in Fife and studied biochemistry at the University of Edinburgh (1988-1992) before completing a PhD in the Department of Biochemistry, University of Dundee (1992-1996). Following postdoctoral research at the John Innes Centre, Norwich (1996-1998) and the University of East Anglia (1998-2000), Frank started his own research group at the University of East Anglia thanks to the award of a Royal Society University Research Fellowship. Frank's initial research focused on protein secretion and protein interactions in bacteria and the quality of this work led to the award of The Fleming Medal (2006) and The Colworth Medal (2007). In 2007 Frank returned to Dundee to join an new research Division of Molecular Microbiology in the College of Life Sciences. Here, his research took off in new directions, including studies of hydrogen production by bacteria. As well as his research activities Frank is also a committed University teacher and was a winner of the Chancellor's Award for Excellence in Teaching at Dundee in 2014.

**Professor Pete Smith**

**"Addressing the joint challenges of climate change and food security"**

Feeding 9–10 billion people by 2050 and preventing dangerous climate change are two of the greatest challenges facing humanity. Both challenges must be met while reducing the impact of land management on ecosystem services that deliver vital goods and services, and support human health and well-being. Few studies to date have considered the interactions between these challenges. The supply- and demand-side climate mitigation potential available in the Agriculture, Forestry and Other Land Use (AFLOU) sector and options for delivering food security are briefly reviewed. Some of the synergies and trade-offs afforded by mitigation practices are outlined, before an assessment of the mitigation potential possible in the AFOLU sector under possible future scenarios is presented, in which demand-side measures co-deliver to aid food security. I conclude that while supply-side mitigation measures, such as changes in land management, might either enhance or negatively impact food security, demand-side mitigation measures, such as reduced waste or demand for livestock products, should benefit both food security and greenhouse gas (GHG) mitigation. Demand-side measures offer a greater potential (1.5–15.6 Gt $CO_2$-eq. $yr^{-1}$) in meeting both challenges than do supply-side measures (1.5–4.3 Gt $CO_2$-eq. $yr^{-1}$ at carbon prices between 20 and 100 US$ $tCO_2$-eq. $yr^{-1}$), but given the enormity of challenges, all options need to be considered. Supply-side measures should be implemented immediately, focusing on those that allow the production of more agricultural product per unit of input. For demand-side measures, given the difficulties in their implementation and lag in their effectiveness, policy should be introduced quickly, and should aim to co-deliver to other policy agendas, such as improving environmental quality or improving dietary health. These problems facing humanity in the 21st Century are extremely challenging, and policy that addresses multiple objectives is required now more than ever.

Keywords: food security, greenhouse gas, mitigation, supply-side, demand-side

**Pete Smith** is Professor of Soils and Global Change at the Institute of Biological and Environmental Sciences at the University of Aberdeen (Scotland, UK), Science Director of the Scottish Climate Change Centre of Expertise (ClimateXChange) and Director of Food Systems for the Scottish Food Security Alliance-Crops. He leads the University of Aberdeen multi-disciplinary theme on Environment & Food Security. Since 1996, he has

served as Convening Lead Author, Lead Author and Author for the Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize in 2007. He was the Convening Lead Author of the Agricultural Mitigation chapter of the IPCC Fourth Assessment Report and for the Agriculture and Forestry Mitigation chapter of the IPCC Fifth Assessment. He has coordinated and participated in many national and international projects on soils, agriculture, food security, greenhouse gases, climate change, mitigation and impacts, and ecosystem modelling. He is a Fellow of the Society of Biology, a Rothamsted Research Fellow, a Research Fellow of the Royal Society (London; 2008-2013), and a Fellow of the Royal Society of Edinburgh.