society for general Microbiology
www.sgm.ac.uk

Programme

Wednesday 3 November 2010

The Cholmondeley Room and Terrace
House of Lords

Microbes and Climate Change

Climate change is a hot topic.

Global warming is a big concern.

Greenhouse gases are in the news.

But what role do microbes play in this global challenge? Microbes are involved in many processes, including the carbon and nitrogen cycles, and are responsible for both using and producing greenhouse gases such as carbon dioxide and methane.

Microbes can have positive and negative responses to temperature, making them an important component of climate change models. However, microbes live in diverse communities that interact with other organisms and the environment, making their impact difficult to predict.

What is certain is that human activities have helped to increase the production of greenhouse gases by microbes.

The Society for General Microbiology welcomes you to this event that we hope you will find both enjoyable and informative.

Programme

1200 *Drinks, canapés & exhibition*

1230 **The Rt Hon the Lord Soulsby of Swaffham Prior**
Introduction and welcome

1235 **Professor Hilary Lappin-Scott**
SGM President
University of Swansea
The role and activities of the SGM

1245 **Dr Dave Reay**
University of Edinburgh
Microbes as climate engineers – an overview

1255 **Professor Andrew Whiteley**
Centre for Ecology & Hydrology
The impact of climate change on soil biodiversity

1305 **Dr Ian Joint**
Plymouth Marine Laboratory
The impact of climate change on marine microbes

1315 **Professor Steve Lindsay**
London School of Hygiene & Tropical Medicine
Climate change and the emergence of vector-borne diseases

1325 **Professor Joanna Verran**
SGM Education & Public Affairs Officer
Manchester Metropolitan University
Question time & closing address

1340 *Drinks, canapés & exhibition*

1430 *End of event*

A vision of a future London. *Tim Vernon / SPL*

Dr Dave Reay

University of Edinburgh

Microbes as climate engineers – an overview

'*Out of sight, out of mind*' is a trait of our species that has long been costing us in terms of our interactions with the microbial world. From typhoid outbreaks to the common cold, from shellfish poisoning to listeriosis, the very fact that we cannot see micro-organisms and their products can make us ignorant of where and how important they are. For global climate change this problem of invisibility is even more stark. The belching smoke stack of a coal-fired power station may constitute an overt signal of carbon dioxide emissions, but the same quantities of carbon dioxide pouring from the surface of a newly ploughed field, and the microbial processes that underpin these emissions, are all too easy to overlook. In this talk I will lift the veil on the key role microbes play in determining global climate and how they may become our allies in addressing human-induced climate change in the 21st century.

A ploughed field (Stockphoto)

Dr Dave Reay studied Marine Biology at Liverpool University and graduated in 1994. He went on to gain a PhD with the British Antarctic Survey and Essex University studying the response of Southern Ocean algae and bacteria to temperature change. After gaining his doctorate he continued working as a postdoc at Essex, investigating the impact of land use on the soil methane sink. In 2001, he moved to Edinburgh University to investigate emissions of the greenhouse gas nitrous oxide from agriculture, then carbon fluxes in forests, and went on to become a Natural Environment Research Council (NERC) Fellow examining greenhouse gas emissions from wetlands and agriculture. In 2008, Dave became the university's first lecturer in carbon management and became a senior lecturer in 2009. Dave has authored a multitude of papers and books on climate change, including the popular 'Climate Change Begins at Home' *(for adults) and* 'Your Planet Needs You!' *(for children). He is director of the MSc in Carbon Management at Edinburgh, designer and editor of the climate change science website* 'Greenhouse Gas Online', *and advisor on climate change to the British Council. He enjoys running (on an annual basis),* Test Match Special *and writing stories for his daughters.*

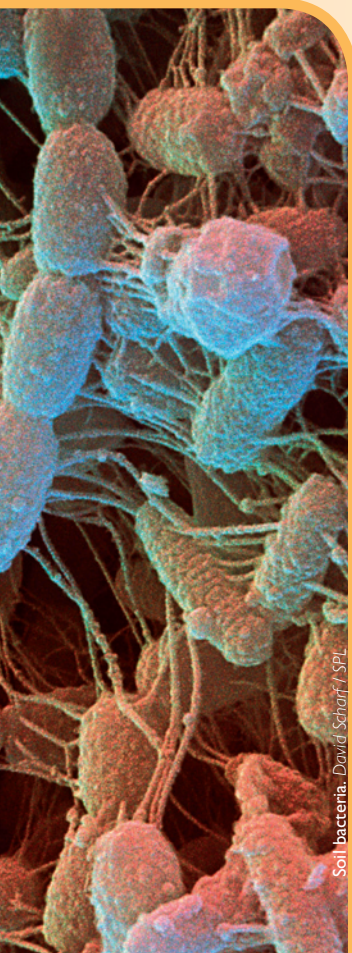
Speakers

Professor Andrew Whiteley

Centre for Ecology & Hydrology (CEH)

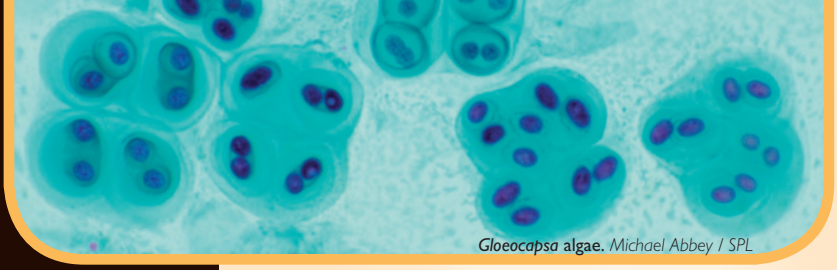
The impact of climate change on soil biodiversity

Microbes are central to all life on Earth due to their huge diversity in form and function. One teaspoon of topsoil contains around 1 billion individual microscopic cells and around 10,000 different species. These organisms have many tasks, and are central to crop fertility, purifying the environment from pollutants, regulating carbon storage stocks and production/consumption of many significant greenhouse gases, such as methane and nitrous oxide. The economic valuation of soils is in a large part due to soil microbial populations which provide key soil functions. Future climate scenarios predict that impacts upon microbial populations in soil will take many forms, from increased losses of soil carbon due to increased respiration, changes in soil-borne greenhouse gas production/consumption and changes to important plant–soil feedbacks, giving rise to soil fertility. Here, I will discuss some probable impacts upon key soil biota and present globally unique 'next-generation' monitoring scenarios which we have initiated within CEH's core science programmes to assess and predict likely consequences of climate change to the UK's soil microbial biodiversity.



Soil bacteria. *David Scharf / SPL*

Professor Andrew Whiteley is a microbial ecologist who specializes in understanding the function of microbes in their natural environment and the processes they carry out that sustain life on Earth. He originally trained as a marine biologist and worked in the area of oceanic microbes and their effects upon ocean nutrient cycling before taking up positions at Newcastle University and then the Centre for Ecology & Hydrology in Oxford, both centred upon terrestrial ecosystems. Here, his team was the first to devise and implement the next generation of DNA-based monitoring methods to assess the microscopic microbial populations at a UK-wide scale in order to understand basic concepts of what environmental factors distribute microbial populations and their functions. Whilst this work addresses fundamental concepts in microbial ecology, it also provides the basis for next-generation monitoring networks to understand and predict the effects of climate shifts.



Gloeocapsa **algae.** *Michael Abbey / SPL*

Dr Ian Joint Plymouth Marine Laboratory

The impact of climate change on marine microbes

Microbes in the seas play an important role in maintaining the health of the planet, making it habitable for people. Half of the oxygen produced by photosynthesis each year comes from microbes in the oceans. Marine microbes recycle nutrients, so maintaining productivity. They also influence the atmosphere through the production and release of biogases that alter atmospheric chemistry. It is essential to understand the contribution of marine microbes in the present-day ocean and how that may change as the seas become warmer and more acidic. Complex feedbacks occur between the ocean and the atmosphere, because marine microbes produce biogases that influence the atmosphere. How might these microbial-driven processes change in the coming century? Fortunately, recent developments in DNA sequencing technologies mean that marine microbiologists are making very rapid progress in understanding this complex ecosystem. We now know with some certainty 'who' is there in the surface ocean (although many marine microbes are novel, they have not been fully described and have not been studied in the laboratory). The challenge now is to understand 'who' does 'what' and if this will alter at this time of rapid climate change.

Dr Ian Joint has been a senior researcher at the Plymouth Marine Laboratory for over 30 years. He has published more than 130 scientific papers on a wide range of marine microbiology, from biogeochemistry to microbial biodiversity studies, and from the tropics to the poles. Recently, he has utilized high-throughput DNA sequencing techniques to investigate how many bacterial species are present in UK coastal waters (about 20,000 in every 10 litres) and how bacteria will respond to ocean acidification and increased temperature at this time of rapid climate change.

Speakers

Professor Steve Lindsay

London School of Hygiene and Tropical Medicine

Climate change and the emergence of vector-borne diseases

A mosquito on human skin. *Eye of Science / SPL*

Pathogens transmitted by insects and ticks kill many millions of people around the world each year. Since these diseases are exquisitely sensitive to changes in temperature, humidity and rainfall there is concern that climate change will increase the risk of vector-borne diseases. Here, I take a closer look at how climate change may affect the future risk of malaria, the most important vector-borne disease, at home and abroad. The evidence suggests that climate change is not the main driver of malaria and that other environmental changes are far more important. Whilst the risk of malaria re-establishing in the UK is highly unlikely, there are other causes for concern. Climate change in the UK may increase the abundance of nuisance insects that will impact on public health, tourism and the economy.

Professor Steve Lindsay studies some of the world's most important vector-borne diseases; chiefly malaria. He is a public health entomologist who develops new tools to reduce the transmission of vector-borne diseases. He was a member of the team in the 1980s that showed that insecticide-treated bednets reduced malaria deaths. More recently, his team demonstrated the importance of house screening to reduce anaemia in children, and that larval control can be an extremely effective method of malaria control in specific situations. He is a strong advocate of the use of Integrated Vector Management. He has studied vector-borne diseases for nearly 30 years and has worked in The Gambia, Ethiopia, Kenya, Pakistan, Tanzania, Thailand and Uganda. He has published over 130 peer-reviewed papers, many in major international journals.

Professor Hilary Lappin-Scott
SGM President
University of Swansea

Hilary has been a member of SGM since 1984 and has been an Elected Officer, Group Convener, Council Member and Meetings Officer at various times since then, and was elected as President of the Society in September 2009. She is currently President of the International Society for Microbial Ecology and a member of the International Board of the American Society for Microbiology. Her day job is Professor of Environmental Microbiology in the Department of Biosciences at Swansea University and Senior Executive Officer in the Vice Chancellor's Office with the portfolio of Change Management and Performance Review.

These roles have provided insights into how learned societies are responding to the exciting developments in microbiology and meeting the professional needs of their members. The SGM has to meet various challenges: microbiologists have to take into account the economic impact factors of their research as never before; there is concern that 'blue skies' research may thus be put under pressure; young researchers need encouragement for the future development of microbiology and learned societies have to survive in very difficult economic circumstances.

Hilary is positive that the SGM is well placed to respond to these pressures and develop new initiatives to promote the art and science of microbiology.

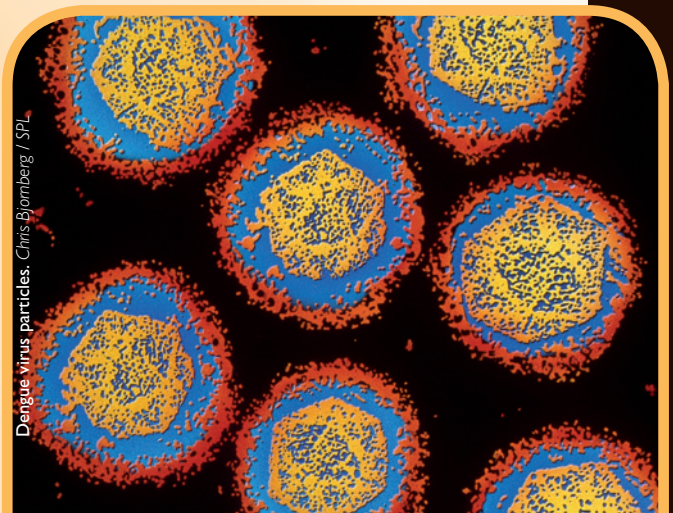
Earth. *Comstock*

Speakers

Professor Joanna Verran
SGM Education & Public Affairs Officer
Manchester Metropolitan University

Joanna is Professor of Microbiology in the School of Biology, Chemistry and Health Science at Manchester Metropolitan University. Her research has focused on interactions between micro-organisms and inert surfaces, with current interests diverging across dentures and hygienic food contact surfaces! She has formed a strong interdisciplinary collaboration with surface engineers and polymer technologists, and the research was submitted within the Metallurgy and Materials UoA. She is Director of the Graduate School in the Faculty of Science and Engineering, and also maintains a significant undergraduate teaching commitment, incorporating several novel learning activities into the curriculum, which she disseminates at conferences, through her website, and via publications. She has been involved in outreach activities with schools, teachers, the general public and the media.

Joanna has been a member of the SGM Education/ Education & Training Group Committees for some time, being Chair for the past 5 years – plus one for good behaviour to help the transition from Group to Division! She was elected as Education and Public Affairs Officer of the Society in September 2009. She has worked closely with staff at SGM headquarters, helping to raise the profile of microbiology through a comprehensive framework of activities to a range of diverse audiences, including parliamentarians, journalists, schools and the general public.



Dengue virus particles. *Chris Bjornberg / SPL*

A melting glacier. *iStockphoto*

Exhibitors

Centre for Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL

The Centre for Ecology & Hydrology is the UK's Centre of Excellence for integrated research in terrestrial and freshwater ecosystems and their interaction with the atmosphere.

www.ceh.ac.uk

Cows. *Comstock*

Health Protection Agency

The Health Protection Agency was established to protect the population from threats to their health from infectious diseases and environmental hazards. The agency combines public health and scientific knowledge, research and emergency planning within one organization, providing advice and information to health professionals, national and local government, and the public.

www.hpa.org.uk

A kelp patty ecosystem. *Gregory Ochocki / SPL*

PML | Plymouth Marine Laboratory

PML is an independent, impartial provider of scientific research, contract services and advice for the marine environment. PML is focused on understanding how marine ecosystems function and reducing uncertainty about the complex processes and structures that sustain life in the seas and their role in the Earth system.

www.pml.ac.uk

Plant leaves infected with rust fungus. *Geoff Kidd / SPL*

ROTHAMSTED RESEARCH

Over its 160 year history, Rothamsted Research has built an enviable international reputation as a centre of excellence for science in support of sustainable land management and its environmental impact. UK arable cropping systems face new or increased threats from diseases as a result of climate change. With expertise in plant pathology and mathematical modelling Rothamsted Research is well placed to improve understanding of the interactions between climate change, arable crop growth and disease epidemics.

www.rothamsted.bbsrc.ac.uk

Society for General Microbiology

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The Society for General Microbiology (SGM) is a professional body for scientists who work in all areas of microbiology. It is the largest microbiology society in Europe, and has over 5,000 members worldwide. The Society provides a common meeting ground for scientists working in research and in fields with applications in microbiology including medicine, veterinary medicine, pharmaceuticals, industry, agriculture, food, the environment and education.
An important function of the Society is promoting the understanding of microbiology to key stakeholders including members of Parliament and the House of Lords.

To be put in touch with SGM experts or to request copies of written resources, please send your enquiry to the address below.

Struggling to survive in a parched land. *iStockphoto*

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