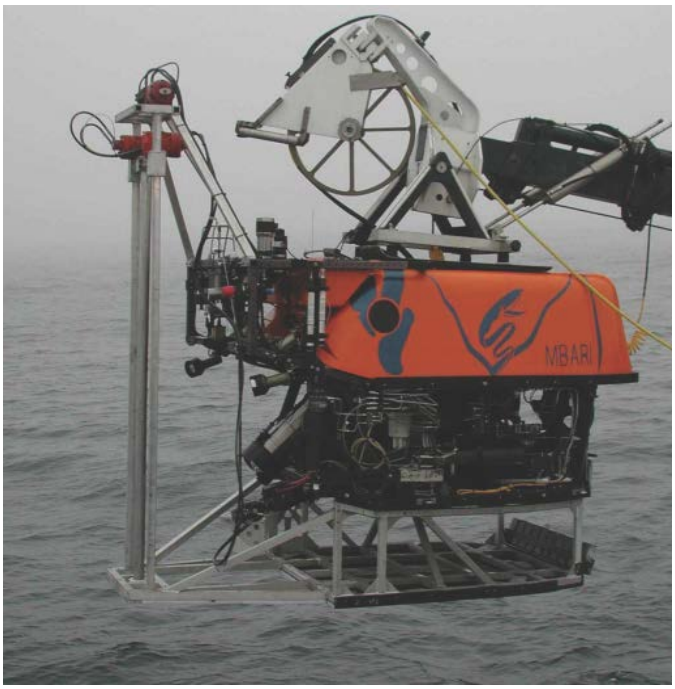
UNIVERSITY OF LIVERPOOL

School of Environmental Sciences

HERDMAN SYMPOSIUM

Saturday 21st February

GEOSCIENCE FRONTIERS 2015



Monterey Bay Aquarium Research Institute's remotely operated vehicle 'Ventana' with attached vibracoring system for sampling seafloor sediments. (Photo: E. Sumner)

GEOSCIENCE FRONTIERS 2015
HERDMAN SYMPOSIUM PROGRAMME
Saturday 21st February

09.30 *Registration (Soft Drinks Available)*

10.00 **Welcome:** Sophie Hill (Herdman Society President), Jessica Bayliff and Amy Shore (Herdman Symposium Secretaries) and Jim Marshall

10.05 **Prof Sanjeev Gupta** (Imperial) "*Adventures of a Field Geologist on Mars: The Curiosity Rover"*

10.50 *Coffee Break*

11.20 **Dr Juliet Biggs** (Bristol) *"A Global View of Volcanoes"*

12.05 **Prof Andy Aplin** (Durham) *"A Fossil Fuel Future? Assessing the Role of Unconventional Hydrocarbons"*

13.00 *Buffet Lunch (Central Teaching Laboratory tours available for A Level students)*

14.00 **Prof Jennifer McElwain** (Dublin) *"The Oldest Strangest Weather..."*

14.45 *Coffee Break*

15.15 **Dr Esther Sumner** (Southampton) *"Turbidity Currents: Ancient and Modern"*

16.00 **Prof Iain Stewart** (Plymouth) *"Between a Rock and a Hard Place: Communicating Geology to Society"*

16.45 *Wine Reception (Wine and Soft Drinks Available)*

Prof Sanjeev Gupta (Imperial) "*Adventures of a Field Geologist on Mars: The Curiosity Rover"*

Talk Abstract

The Mars Science Laboratory rover, *Curiosity*, has now been on the surface of Mars for over two years. Since its landing in Gale crater, this car-sized rover has been crossing the plains between the crater rim and Mount Sharp conducting an investigation of ancient rock formations and their potential to record ancient habitable environments. This talk will describe the rover's explorations and adventures, and discuss the latest findings.

The 155-km diameter Gale Crater was chosen as *Curiosity's* field-site based on several attributes including an interior mound of ancient flat-lying strata extending almost 5 km above the elevation of the landing site. The lower few hundred meters of the mound show a progression with relative age from clay-bearing to sulfate-bearing strata, separated by an unconformity from overlying likely anhydrous strata.

In its 9 km journey from the Bradbury landing site to its current location at Pahrump Hills, the rover has encountered an exciting array of sedimentary rocks that enable us to reconstruct a range of potential habitable environments. In this talk I will describe how scientists and engineers working on the *Curiosity* mission conduct robotic field geology on the Red Planet.

About the speaker

Prof. Sanjeev Gupta is a geologist in the Department of Earth Science and Engineering at Imperial College. He is interested in the evolution of surface environments and processes on Earth and Mars. He has spent much of his career studying ancient sedimentary rock formations in places like the Sinai Peninsula, Egypt, and New Mexico. He analyses sedimentary rocks to reconstruct ancient landscapes and past environmental conditions. He is a Participating Scientist on NASA's Mars Science Laboratory - the Curiosity rover - where his role is to analyse ancient sedimentary rocks on Mars and determine if the Red Planet could ever have been habitable for life.

Dr Juliet Biggs (Bristol) *"A Global View of Volcanoes"*

Talk Abstract

Natural hazards are a feature of our planet; we cannot prevent the events and processes that cause them, so we must learn to live with them. They occur in countries spanning a range of development levels: in some cases, the hazards, management plans and risks are well defined, but in others, often developing countries, identifying the hazards themselves still remains a challenge and in some areas, the lack of physical and financial infrastructure means the consequences of even a small volcanic eruption can be catastrophic. When it comes to volcanoes, there is no simple relationship between eruption magnitude and impact.

For some of the better-known volcanoes, such as Montserrat, great strides have been made in monitoring. As a consequence of such advances, it is estimated that at least 50,000 lives may have been saved globally in the past century. But for many volcanoes, satellite imagery is often the only source of monitoring information. Of the three major volcano monitoring datastreams - seismicity, deformation and gas emissions - only seismicity cannot be observed via satellite. Furthermore, satellite imagery watches volcanoes throughout their eruptive cycles and can provide some of the earliest warnings of unusual behaviour. Now, satellite technology is rapidly evolving and routine monitoring of all volcanoes is anticipated. Despite this wealth of data, a major challenge remains to determine whether an episode of volcanic unrest will culminate in eruption.

In this talk, I will show how satellites have contributed to some of the recent major advances in understanding magmatic and volcanic processes, how the global perspective they provide can be used to study patterns in volcanic behaviour on a tectonic scale, and highlight the questions that are at the forefront of today's research.

About the speaker

Juliet Biggs uses Earth Observation data to study active tectonic processes such as earthquakes and volcanoes. She received BA and MSci degrees in Natural Sciences in 2003 from the University of Cambridge with specialisation in geology and geophysics. In 2007, she received a PhD from the University of Oxford for her work on the earthquake cycle in Alaska, and was a postdoctoral fellow in the US and with the European Space Agency before taking a permanent post at the University of Bristol. Her current research uses satellite observations to study the volcanoes of the East African Rift and Latin America and on placing satellite observations into a global framework.

Prof Andy Aplin (Durham) *"A Fossil Fuel Future? Assessing the Role of Unconventional Hydrocarbons"*

Talk Abstract

As the world strives to reduce its emissions of greenhouse gases, it will nevertheless remain highly dependent on fossil fuel energy for several decades. Based on what we know from the US, and what we might know from other areas of the world, including the UK, what role might unconventional hydrocarbons such as shale gas and oil play in this uncertain future?

About the speaker

Andrew Aplin is Professor of Unconventional Hydrocarbons at Durham University. After degrees in Environmental Science from UEA and Marine Geochemistry from Imperial College, he was a postdoc in Nancy, worked for BP for seven years and then many more than seven at Newcastle University. His research interests have centred on shale for many years, not only in the context of shale gas but also in terms of safe storage of CO_2. Outside the fabulous world of shale, he occasionally staggers around triathlon courses in the SuperVet (very old) category.

Prof Jennifer McElwain (Dublin) "*The Oldest Strangest Weather...*"

Talk Abstract

Global climate and atmospheric composition are currently changing at an unprecedented rate. This talk aims to put current climatic change into a longer term geological perspective using fossil plants. Plants are intimately linked to their environment and when fossilized can be used as indicators or 'proxies'; of past climatic change, weather and atmospheric composition. The 'oldest strangest weather' will be explored over a 400 million year record of exceptional fossil plant preservation and using knowledge from modern day 'mini world' plant experiments.

About the speaker

Jennifer C McElwain is a Professor of Plant Palaeobiology and Palaeoecology in University College Dublin's School of Biology and Environmental Science and member of UCD Earth Institute. She is the director of PEAC (Program for Experimental Atmospheres and Climate). Her teaching and research focus on plant evolution from the perspective of the plant fossil record and on global climate and atmospheric change as revealed from fossil plant proxies.

Dr Esther Sumner (Southampton) *"Turbidity Currents: Ancient and Modern"*

Talk Abstract

Turbidity currents are giant flows in the ocean that transport sediment from land to the deep sea. Turbidity currents are important because in modern oceans they pose a hazard to seafloor infrastructure and provide nutrients to seafloor ecosystems, whilst the deposits of ancient flows contain some of our largest remaining hydrocarbon reserves. Unfortunately, we have very few observations of full-scale turbidity currents and as a result fundamental questions remain regarding their character and how this is recorded in ancient deposits. In recent years we have been able to begin investigating the dynamics of modern turbidity currents directly using new technologies. This includes: using unmanned submarines to map the seafloor and underwater vehicles to retrieve precisely located sediment samples; deploying moorings in submarine canyons to measure flow velocities and capture samples of sediment; as well as rare visual observations from an underwater vehicle that was unexpectedly swept away by a turbidity current. Finally, I'll talk about plans to deploy an array of instruments in Monterey Canyon next autumn in order to collect the most comprehensive source-to-sink measurements of a turbidity current ever attempted.

About the speaker

Esther Sumner is interested in the dynamics and deposits of submarine gravity currents and other geophysical flows. Her research combines: direct monitoring of submarine gravity currents in the oceans, studying deposits in ancient outcrops and on the modern seafloor as well as testing new hypotheses about flow dynamics in the laboratory. She is a Lecturer in Sedimentology at the University of Southampton, having held research fellowships at Monterey Bay Aquarium Research Institute, USA, the University of Leeds and the National Oceanography Centre Southampton. She gained her PhD from the University of Bristol in 2009.

Prof Iain Stewart (Plymouth) "*Between a Rock and a Hard Place: Communicating Geology to Society"*

Talk Abstract

Geoscientific knowledge and understanding lies at the heart of many of the most critical societal issues that face us in the 21st century. The pressing human challenges of natural disaster reduction, energy supply and security, and mineral and water resource management, rest on geological foundations. And yet, outside of the academic and industrial geoscience community there is a limited appreciation of Earth Science, especially among policy makers. Geology , it seems, lies out of sight and out of mind. For that reason, geologists are increasingly being encouraged to communicate more broadly what they do and what they know. Yet how can we do that when, for most people, geology is about 'stones' and stones are 'boring'! It is a problem compounded by the fact that many of our most acute geo-issues are rooted in the unfamiliar realm of the deep subsurface. This talk will use the experience of popularising geoscience for mainstream television to explore ways in which geologists can make our subject connect better with the dissonant public, and in doing so forge more effective strategies for meaningful public engagement.

About the speaker

Iain Stewart, professor of Geoscience Communication at Plymouth University, is an Earth scientist who specialises in recent geological change. After studying Geography and Geology at Strathclyde University (1986), and completing a PhD in earthquake geology at Bristol University (1990), he taught Earth Science at Brunel University until 2002. He then left to develop public geoscience projects, and over the last decade or so has presented major television series for the BBC on the nature, history and state of the planet. Among these are 'Earth: The Power of the Planet', 'Earth: The Climate Wars', 'How Earth Made Us', 'How To Grow A Planet', 'Volcano Live', and 'Rise of the Continents'. He regularly fronts BBC Horizon specials on geoscientific topics (Japanese earthquake, the Russian meteor strike, Shale gas/ Fracking, Florida sinkholes). His latest BBC series - a 3-parter on the history of petroleum - will air in 2015 as 'Planet Oil'.

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