

Greenhouse Earth Symposium

Wednesday 14 January 2009

Oceania, Te Papa Tongarewa, Museum of New Zealand, Wellington

In this one-day symposium, leading international research scientists will showcase the role that research into the ancient greenhouse world of the Paleogene, 65 to 35 million years ago, plays in advancing understanding of modern climate change.

Symposium speakers will explore:

- the role of greenhouse gases in driving Paleogene episodes of extreme global warming
- the consequences of global warming for biological systems
- the nature of natural feedback systems that serve to modulate climate and atmospheric greenhouse gas levels
- the effectiveness of climate models in simulating greenhouse climate states

Presentations in this symposium will be targeted towards a non-specialist audience with an interest in the science behind climate change and, specifically, greenhouse gas-induced global warming.

The symposium is part of a four day conference on “Climatic and Biotic Events of the Paleogene” (CBEP 2009).

Register online for the Greenhouse Earth Symposium on the CBEP 2009 conference website: <http://www.gns.cri.nz/cbep2009>

For more information, email the convenors: cbep@gns.cri.nz

Symposium registration deadline: Friday 19 December



Hosted by GNS Science and sponsored by Victoria University of Wellington through the Climate Change Research Institute, the Antarctic Research Centre and the School of Geography, Environment and Earth Sciences



Victoria University
of Wellington, New Zealand
*Te Whare Wananga o te
Upoko o te Ika a Maui
Aotearoa*



Climatic and Biotic Events
of the **Paleogene**
12–15 January 2009, Wellington, New Zealand



The speakers

Peter Barrett is Professor of Geology and Deputy Director of the Climate Change Research Institute at Victoria University of Wellington, and past Director of the Antarctic Research Centre. His extensive research career has focussed on the history and future of the Antarctic ice sheet based on geological records recovered from drilling on the Antarctic margin.



Gabriel Bowen is Assistant Professor in the Department of Earth and Atmospheric Sciences at Purdue University, Indiana. He is interested in the interaction between climate and terrestrial ecosystems: how climate change affects and is affected by ecosystem change. His research uses measurements of naturally occurring stable isotopes and modelling to identify and characterize these effects, both in the modern environment and in the geological record.

Henk Brinkhuis is Professor of Marine Paleobiology, Utrecht University. He specialises in marine palynology, in particular the stratigraphy, palaeoceanography, and paleoecology of Mesozoic-Cenozoic organic walled dinoflagellate cysts. His primary research focus is ancient global change, extreme climate transitions, and biogeochemical cycles.



David Greenwood is Professor of Environmental Science at Brandon University, Canada. He uses plant fossils to reconstruct past climates, especially for times of global warmth. His research has taken him to the Australian desert, tropical rainforests, and the varied landscapes of North America, including the Canadian High Arctic.

Ewan Fordyce is Associate Professor in Geology at Otago University. He specialises in the evolutionary history of whales and dolphins based on extensive collections of fossil cetaceans in sedimentary rock sequences in Canterbury and Otago. He also uses chemical indicators from fossils to study SW Pacific marine environments and climate through Cretaceous and Cenozoic times.



Chris Hollis is a senior scientist at GNS Science, Lower Hutt. He specialises in the study of fossil radiolarians, a diverse group of marine plankton with shells of opaline silica. For the last ten years he has led research teams in studies of the SW Pacific record of early Paleogene climatic and biotic events, including the Cretaceous-Paleogene mass extinction and the Paleocene-Eocene thermal maximum.

Matthew Huber is Associate Professor in Earth and Atmospheric Sciences at Purdue University, Indiana. He is a climate dynamicist who focuses on the ocean-atmosphere processes that regulate the export of heat from the tropics to the poles and the relationship of these processes to climate change in greenhouse intervals such as the Eocene.



Carlos Jaramillo is a staff scientist at the Smithsonian Tropical Research Institute, Panama. He utilises plant fossils to investigate the causes, patterns, and processes of tropical biodiversity at diverse scales in time and space. He is particularly interested in determining the nature of tropical biodiversity changes at time of extreme global warming in the early Paleogene.

Richard Norris is Professor of Paleobiology at Scripps Institution of Oceanography, La Jolla, California. He specialises in the study of fossil foraminifera and has undertaken research on the paleoceanography of Paleogene and Cretaceous warm periods, the role of plankton evolution in biogeochemical cycles, and the structure and dynamics of large-scale diversification in the history of life.



Mark Pagani is Associate Professor in Geology at Yale University. His research in biogeochemistry, paleoceanography and paleoclimatology focuses on understanding the factors driving climate during the Cenozoic. His approach applies the isotopic and trace element compositions of foraminifera and abundances of organic molecules (biomarkers) to characterise ancient ocean, terrestrial and atmospheric conditions.

Paul Pearson is Professor in Paleoclimatology at Cardiff University. He specializes in evolutionary and geochemical studies of planktonic foraminifera, and is particularly interested in what they tell us about the long history of climate change on Earth. He has helped develop new proxies for determining past seawater pH and atmospheric carbon dioxide levels, and hence the history of the greenhouse effect.



Appy Sluijs is a post-doctoral researcher at the Institute of Environmental Biology, Utrecht University. He is combining multiple environmental indicators, such as dinoflagellate cyst micropaleontology and TEX₈₆ paleothermometry, to reconstruct marine temperatures during the 'fossil greenhouse world' of the early Paleogene, particularly across phases of rapid carbon injection such as the Paleocene-Eocene thermal maximum and Eocene Thermal Maximum 2.

Francesca Smith is Assistant Professor in Earth and Planetary Sciences at Northwestern University, Illinois. She specialises in the study of plant compounds, such as lipids, which can tell us a great deal about the plant's growth conditions, especially climate and atmospheric conditions.



Ellen Thomas has joint positions as senior researcher at Yale University and Professor of Earth and Environmental Sciences at Wesleyan University, Connecticut. She studies benthic foraminifera, which can be used as indicators of long-term changes in the deep-sea ecosystem, the largest and least known habitat on Earth, during times of global warming, cooling and asteroid impact.

Scott Wing is Curator of Fossil Plants at the Smithsonian Institution, Washington. He specialises in the fossil record of land plants over the last 75 million years. For the last 15 years he has been working on the dramatic warming event at the start of the Eocene (55 million years ago). His current field projects are in the Rocky Mountains of western North America and northeastern Colombia.



James Zachos is Professor of Earth and Planetary Sciences at University of California, Santa Cruz. He is a paleoceanographer who measures the chemical composition of fossils to reconstruct various features of past climates including marine temperatures, circulation patterns and continental ice-volume, as well as ocean carbon chemistry. His research is oriented toward identifying the mechanisms responsible for driving long and short-term changes in global climate, and impacts of abrupt climate change on ecosystems.

Programme

08:15 – 08.45 Symposium registration

08:45 – 10.30 Session 1 (The Paleogene greenhouse, chair Matt Huber)

- Greenhouse and icehouse transitions and the role of feedbacks – *James Zachos*
- New insights into Paleogene hyperthermals from marginal marine records – *Appy Sluijs*
- The world without us: Paleogene hyperthermals and lessons for future climate – *Richard Norris*
- Global temperature over the last 100 million years: from greenhouse to icehouse – *Peter Barrett*

10:30 – 11:00 Break

11:00 – 12:45 Session 2 (Climate consequences, chair Erica Crouch)

- An Austral view of the history of Paleogene mammals and birds – *Ewan Fordyce*
- Life on land during the last great warming – *Scott Wing*
- A multiple proxy approach to estimating hydrology during the Paleocene-Eocene thermal maximum – *Francesca Smith*
- A giant Arctic freshwater pond at the end of the early Eocene – Implications for ocean heat transport and carbon cycling – *Henk Brinkhuis*

12.45 – 13:30 Lunch

13:30 – 15:15 Session 3 (Climate gradients, chair Richard Pancost)

- Arctic Paleogene forests and climate – *David Greenwood*
- How global warming affects tropical rainforests? A Paleogene perspective – *Carlos Jaramillo*
- Climate see-saws in Paleogene New Zealand – *Chris Hollis*
- Eocene ocean temperatures and climate gradients – *Paul Pearson*

15:15 – 15:45 Break

15:45 – 17:30 Session 4 (Climate drivers, chair Henk Brinkhuis)

- Tracing greenhouse carbon using carbon isotopes – *Gabriel Bowen*
- The Cretaceous/Paleogene carbon cycle – *Ellen Thomas*
- Greenhouse? What Greenhouse? – *Mark Pagani*
- Heating up a warm world – *Matthew Huber*

17:30 – 18:30 Public Lecture

Rapid global warming and ocean acidification 55 million years ago: Lessons for the future – *James Zachos*