The SAGE
Handbook of

Environmental Change

Volume 1

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The SAGE Handbook of Environmental Change

Volume 1

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Notes on contributors

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Patrick J. Bartlein is a Professor of Geography at the University of Oregon. His research focuses on regional climatic variations, both paleo and present-day, and how these are controlled by atmospheric circulation and the surface water and energy balance. He is also interested in paleohydrology and paleoecology (in particular, paleofire), as recorders of past climatic changes and as elements of the Earth system. He has participated in the successive iterations of "data-model comparisions" involving suites of climate-model simulations and syntheses of palaeoclimatic data, and teaches courses in climatology, global environmental change, and the analysis and visualization of scientific data.

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Matthew Baylis holds the Chair of Veterinary Epidemiology at the University of Liverpool. For 20 years he has studied vector-borne diseases of animals and humans, including African animal trypanosomosis, African horse sickness, bluetongue. Japanese encephalitis and plague. In recent years he has focussed on the impacts of climate on such diseases, and the role that climate change may play in disease emergence and spread. Much of this work is undertaken through the Liverpool University Climate and Infectious Diseases of Animals (LUCINDA) group, which he heads.

Martin Beniston studied Environmental Science at the University of East Anglia and Atmospheric Physics at the University of Reading before obtaining his PhD in Atmospheric Modelling at P&M Curie University in Paris. He has undertaken atmospheric and climate research in France, Germany, Canada and later in Switzerland, where he shared his work between ETH in Zurich and the vice-chairmanship of an 'Impacts' working group of the IPCC (awarded the 2007 Nobel Peace Prize). Appointed full professor at Fribourg University in 1996, he moved in 2006 to become Director of the Institute for Environmental Sciences at the University of Geneva. He has close to 150 papers on topics related to climate change and impacts, including 4 books and a further 9 edited volumes with international publishers. Since 2008, he is the coordinator of a major European project related to water and climate in vulnerable mountain regions (www.acqwa.ch).

Helen Bennion is a Principal Research Associate at the Environmental Change Research Centre, University College London. The central focus of her research is to understand the causes, timing and magnitude of ecological change (principally caused by nutrients and climate change) in aquatic systems so we may better manage these ecosystems in the future. She is internationally recognised in the field of palaeolimnology with major contributions to the development of diatom models for assessing lake eutrophication, development of multi-proxy approaches for understanding ecological changes in lakes over decadal to centennial timescales, innovative methods for employing the lake sediment record to assess reference conditions and restoration targets, and the use of the sediment record for understanding climate-nutrient interactions. She has published eight book chapters on topics such as diatoms as indicators of environmental change and palaeoecological assessments of environmental change. She became an elected member of the International Advisory Committee of the International Paleolimnology Association in 2008.

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Richard A. Betts leads the Climate Impacts research team in the Meteorological Office Hadley Centre. He has worked as a climate modeller for over 18 years, and has pioneered a number of key scientific developments on ecosystem-climate feedbacks and an integrated view of climate change impacts. He was involved in development of the first coupled climate-carbon cycle general circulation model, and in subsequent advances in this field. He has a particular interest in processes of climate change and its impacts beyond the radiative effect of greenhouse gases, including anthropogenic land cover change and the effects of changes in atmospheric composition on plant physiology. He was a lead author on the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and the Millennium Ecosystem Assessment, in both cases assessing the influence of ecosystems and anthropogenic land cover change on climate. He is now a lead author on the IPCC Fifth Assessment Report, contributing to the assessment of the impacts of climate change on terrestrial ecosystems.

Paul Bishop has been Professor of Physical Geography in the University of Glasgow since 1998. His undergraduate degree is from the School of Earth Sciences at Macquarie University in Sydney, as are his PhD and recently awarded DSc. His research focuses principally on long-term landscape evolution, with a key interest being the ways in which tectonics and surface processes interact, as mediated by bedrock rivers. Low-temperature thermochronology and cosmogenic nuclide analysis are key techniques for that research, which has always been undertaken with teams of post-doctoral researchers and PhD students.

Simon P. E. Blockley is a Quaternary scientist working on the chronology of past climate change and human adaptation. He work principally studying the timing and nature of abrupt climate change over the last 100,000 years and the role of climate change in the adaptation and later evolution of humans in the past. He has published numerous articles on both climate change and Palaeolithic archaeology. His main specialisation is high precision dating of both environmental records including radiocarbon dating, statistical age modelling techniques and particularly the use of volcanic marker horizons as tools to date and link sites together. His most recent work in this area has looked at the potential role of climate in the transition from the middle to upper Palaeolithic and the end of the Neanderthals and most recently the role of climate in the origin of agriculture at the end of the last glacial period.

Stella M. Blockley took a first degree and in Archaeology, and MSc in Human Osteology and Palaeopathology and a PhD in Archaeology at the University of Bradford. She then worked as a postdoctoral researcher in archaeology at Royal Holloway, University of London. She is now a teacher of science and independent researcher.

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temperature change. Besides tree-ring research, his interests encompass the study of recent climate change based on instrumental records, and the application of various palaeoclimate data for describing 'natural' climate variability and its relationships with possible forcing factors. He was a Lead Author of Chapter 6 (Palaeoclimatology) of the Fourth Assessment Report of Working Group 1 of the Intergovernmental Panel on Climate Change. He has served on various national and international Scientific Steering Committees and on the editorial boards of the journals *Holocene, Boreas and Dendrochronologia*.

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Chris Cocklin is Deputy Vice-Chancellor (Research & Innovation) at James Cook University, Australia. His research interests are in resources and environmental policy, agriculture and rural communities, global environmental change, sustainable development, and corporate environmental management. He was appointed by the Intergovernmental Panel on Climate Change (IPCC) as a lead author of the Fourth Assessment Report. Professor Cocklin is a member of the Queensland Premier's Advisory Council on Climate Change.

Ben Daley is Lecturer in Environmental Management in the Centre for Development, Environment and Policy at the School of Oriental and African Studies (SOAS), University of London. His research focuses on environmental change and environmental history, and he has lectured in geography, environmental management and sustainable development. His research has focused on the environmental history of the Great Barrier Reef and coastal Queensland; he has also worked on a variety of other environmental issues, including climate change and the environmental impacts of air transport and of tourism. He is the Academic Director of the MSc Sustainable Development programme at SOAS.

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Alastair G. Dawson is a graduate of the University of Aberdeen (BSc Hons), Louisiana State University (MSc) and the University of Edinburgh (PhD). He was appointed Professor of Quaternary Science in 1998 at Coventry University. Since 2005 he has been Professor at the University of Aberdeen where he is Assistant Director of the Aberdeen Institute for Coastal Science and Management (AICSM). He is the author of numerous papers on climate change research, His book, *Ice Age Earth* is highly acclaimed and recently, 'So Foul and Fair: A history of Scotland's weather and climate' has received international recognition. In addition to his research interests in climate change, Alastair has undertaken coastal change research for many years. Since 1987 he has published widely in the field of tsunami geoscience.

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John A. Dearing is currently Professor of Physical Geography in the School of Geography at the University of Southampton, UK. For over 30 years he has studied long-term interactions between human activity and environmental change through magnetic and other analyses of lake sediments. More recently, he has focused his research on how we can learn from the past about the functioning and management of contemporary socio-ecological systems, particularly with regards complex and nonlinear effects. This research lies at the heart of his involvement with the IGBP-PAGES Focus 4 programme 'Past Human-Climate-Ecosystem Interactions', which he currently chairs.

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David Frank is a dendroclimatologist at the Swiss Federal Research Institute WSL. His research interests include regional to hemispheric-scale climate variability, the impacts of climate change on intraseasonal to multicentennial tree growth, the global carbon cycle and methods of climate reconstruction. He has published on a wide variety of global climate change related topics in over 60 peer-reviewed articles and has collected tree-ring data from the boreal forests of Alaska to the tropical forests of New Caledonia.

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Iain Gordon completed his PhD in Zoology from Cambridge University with postdoctoral research on the management of wetlands for biodiversity conservation in the Camargue, France. During the next 15 years of his career at the Macaulay Institute in Scotland he built a research team of 65 scientists to specialise in understanding and mitigating rural land management impacts on biodiversity and ecosystem services. He joined the Commonwealth Scientific and Industry Research Organization (CSIRO) in Australia six years ago to lead the Rangeland and Savannas group, based in Townsville where he led CSIRO's Building Resilient Biodiversity Assets Theme. Iain returned to Scotland in 2010 and is now chief executive and director of The James Hutton Institute. He has an extensive academic record as evidenced by his substantial list of publications in international peer reviewed journals (over 180), four books (two in the past two years), editorial positions on seven international journals.

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William D. Gosling is a Lecturer in Earth and Environmental Sciences at The Open University with a special interest in human, climate and environment interactions during the Quaternary

in the tropics. He employs a multiproxy approach to help understand past environmental change, with particular focus on vegetation reconstruction based upon pollen analysis. Major projects include the investigation of Lakes Titicaca (Bolivia/Peru) and Bosumtwi (Ghana); two of only a handful of terrestrial tropical records to span multiple glacial-interglacial cycles.

Stephan Harrison's main research interests lie in geomorphological responses to climate change, especially in mountain regions. He has worked for 12 field seasons on the glaciers of Patagonia studying their fluctuation histories since the Last Glacial Maximum and the geomorphological impact of recent glacier retreat on valley-side slopes. He also has research interests in the philosophy of physical geography. He has written on the ontology of quantum theory as an argument against realist philosophy in geography, and argued for the identification of emergent properties in landscapes as an alternative to the reductionist model-building paradigm. He is a co-author, with Steve Pile and Nigel Thrift, of *Patterned Ground: Entanglements of Nature and Culture* which was published in 2004.

Alan Haywood is Professor of Palaeoclimate Modelling at The University of Leeds, Leeds, UK. He is also principal investigator for palaeoclimate within the National Centre for Atmospheric Science. His expertise is in climate modelling. With an Earth science background he brings an understanding of the geological record to modelling that provides a robust interpretation of the geological data used to initialise models. His research focuses on understanding the processes that governed past climates. In particular, his interests and expertise lie in the synthesis of palaeoenvironmental data and its use within climate, ice sheet and vegetation modelling exercises. From 2003 to 2007 he was a Principal Investigator at the British Antarctic Survey, charged with the development and management of a multi-million pound research programme, Greenhouse to Ice-house Evolution of the Antarctic Cryosphere and Palaeoenvironment. In 2007 he was the recipient of a USGS Mendenhall Fellowship award that forms part of the PRISM project (Pliocene Research Interpretations and Synoptic Mapping). In 2008 he was awarded a Philip Leverhulme Prize in recognition of his contribution to palaeoclimatology. In 2011, he was awarded an EU ERC award for Pliocene climate modelling. He has published more than 60 papers on climate and environmental modelling.

Daniel Hill is a Postdoctoral Research Associate in Climate Change at the British Geological Survey. His main research focus is on modelling the climate of the Pliocene Epoch and applying an integrated Earth system approach to studying past climate. Having previously worked extensively with ice sheet models, he has recently been awarded an Early Career Fellowship by the Leverhulme Trust to apply the latest Hadley Centre climate and Earth system models to key palaeoclimates, to be hosted by the School of Earth and Environment at the University of Leeds.

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Shawn Marshall is a Professor of Glaciology and a Canada Research Chair in Climate Change at the University of Calgary. He studies glacier-climate processes, glacier dynamics, and the role of Quaternary and contemporary ice sheets in the global climate system. His research includes field and modelling studies in western and Arctic Canada, Iceland, and Greenland.

Joseph A. Mason's research is focused on the interpretation of landforms, sediments and soils in aeolian and hillslope systems as products of geomorphic processes, climate change and human impacts. Toward this end, he has investigated the stratigraphy and paleoenvironmental significance of loess and hillslope deposits in the central U.S.A. He and his colleagues have also studied the chronology of dune activity and dunefield geomorphology in the Great Plains and China, to assess long-term and recent changes in moisture, wind regime and human impacts. Mason is Professor of Geography at the University of Wisconsin-Madison, where he received his PhD in 1995.

John A. Matthews is Emeritus Professor of Physical Geography at Swansea University, Wales, UK, where he was also Director of the Swansea Radiocarbon Dating Laboratory. His main research interests are in Holocene environmental change, with particular reference to glacier and climatic variations, landscape change and dating techniques. While based at the Universities of London, Edinburgh, Cardiff and Swansea, Professor Matthews has led 40 Jotunheimen Research Expeditions to southern Norway for which he received the Ness Award of the Royal Geographical Society in 1988 and was honoured by an invitation to meet the King and Queen of Norway at a State Banquet at Buckingham Palace in 2005. As founding editor of *The Holocene* he has edited well over 100 issues of this interdisciplinary journal dedicated to recent environmental change. His publications include 150 papers in a wide range of scientific journals and seven books, including *The Ecology of Recently-Deglaciated Terrain* (Cambridge University Press, 1992); *The Encyclopaedic Dictionary of Environmental Change* (Arnold, 2001) and *Geography: A Very Short Introduction* (Oxford University Press, 2008).

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H. Jay Melosh is a Regents Professor at the Lunar and Planetary Laboratory, University of Arizona. He is considered an expert on the subject of impact cratering, a field he has studied and published about for 30 years. He is also a Science Team Member on NASA's Deep Impact mission that successfully impacted an instrument package into Comet Tempel 1 on 4 July 2005.

He received an AB degree in Physics from Princeton University in 1969 and a PhD in Physics and Geology from Caltech in 1973. His principal research interests are impact cratering, planetary tectonics, and the physics of earthquakes and landslides. His recent research includes studies of the giant impact origin of the moon, the K/T impact that extinguished the dinosaurs, the ejection of rocks from their parent bodies and the origin and transfer of life between planets. Professor Melosh is Fellow of the Meteoritical Society, the Geological Society of America, the American Geophysical Union and American Association for the Advancement of Science. He was awarded the Barringer Medal of the Meteoritical Society in 1999, the Gilbert prize of the Geological Society of America in 2001, the Hess medal of the American Geophysical Union in 2008 and was a Guggenheim Fellow in 1996–1997. Asteroid #8216 was named 'Melosh' in his honour. He was elected to the National Academy of Sciences in 2003. He has published approximately 150 technical papers, edited two books and is the author of a major monograph, *Impact Cratering: A Geologic Process* (Oxford University Press, 1989). He is currently preparing a graduate level textbook entitled *Planetary Surface Processes*.

Craig Miller is a Scientist and Environmental Consultant working to integrate social and ecological knowledge in the quest for sustainable development, sustainable livelihoods, and a healthy environment. He has a background in conservation and restoration ecology, but has more recently worked with Australian dairy farmers to reduce their vulnerability to the complex dynamics of the climate-commodity system, rural Indonesian groups to identify adaptation options for sustainable livelihoods in the face of climate change, and a watershed management board in the Philippines seeking water security from a contested watershed subject to a variable climate and increasing population. His research philosophy is transdisciplinary and integrative, and he is continuing to learn how best to apply system dynamics methods to the process of integrating scientific theory and stakeholder knowledge to address complex and/or disputed problems.

Cary J. Mock is a climatologist in the Geography Department at the University of South Carolina. His research and teaching interests are in synoptic climatology, historical climatology and environments and late Quaternary paleoclimatology. His synoptic and paleoclimatic research has focused on the western United States and Beringia, which includes the application of modern synoptic climate analogs to aid in data/model comparisons. His historical climate research has dealt with climate reconstructions of the last several centuries for various areas over North America, and most recently, he has worked on historical hurricane reconstructions for the Atlantic Basin and the Western Pacific Ocean.

Katie Moon is a PhD candidate at James Cook University, Australia. Her research focus is on the social dimensions of policy development and implementation for the conservation of biodiversity on privately managed land. Prior to commencing her research career, Katie worked in the environmental policy arena for 10 years within Australia and Europe, both in government and the private sector. She was responsible for regional and national environmental policy development in the UK, and for the implementation of environmental policy in Australia.

Andrew P. Morse is a Reader in Climate Impacts in the School of Environmental Science, University of Liverpool. He works on the impacts of climate variability and climate change on human and animal health. He is best known for his work in integrating impacts models, especially dynamic malaria models, into seasonal scale ensemble prediction systems. Most recently he has started to work on climate change model outputs integrating the same impact models using probabilistic approaches to bound the uncertainties in such projections.

Raimund Muscheler is Research Fellow of the Royal Swedish Academy of Sciences and is working at the Department of Earth and Ecosystem Sciences at Lund University. His research focuses on cosmogenic radionuclides measured in tree rings, sediments and ice cores. This field comprises topics such as solar and geomagnetic modulation of galactic cosmic rays, the production and atmospheric transport of 10Be and the effects of changes in the carbon cycle on atmospheric radiocarbon. Reliable reconstructions of past changes in solar activity and the influence of solar activity variations on climate are among his main interests.

Donald R. Nelson is Assistant Professor in the Department of Anthropology at the University of Georgia, USA, and Visiting Fellow at the Tyndall Centre for Climate Change Research at the University of East Anglia, UK. He works with communities in water-stressed regions and focuses on water resources management, drought mitigation, and rural development. He places strong emphasis on participatory methods and local planning processes as a way to promote human well being and adaptation to changing social and biophysical environments.

Kevin J. Noone is Professor of Chemical Meteorology at the Department of Applied Environmental Sciences and the Stockholm Resilience Centre at Stockholm University, and is Director of the Swedish Secretariat for Environmental Earth System Sciences (SSEESS) at the Royal Swedish Academy of Sciences. He was Executive Director of the International Geosphere-Biosphere Programme from 2004–2008. He has a background in Chemical Engineering, and Civil and Environmental Engineering, Oceanography, Meteorology Atmospheric Physics. His primary research interests at present are in the area of atmospheric chemistry & physics, the effects of aerosols and clouds on air quality and the Earth's climate, and Earth System Science for Sustainability. Kevin has headed up of a number of large international field experiments, and is (or has been) a member of a number of international committees and boards, currently including chairing the European Academies Science Advisory Council's Environment Steering Panel and is vice-Chair of the International Group of Funding Agencies. He is author/coauthor of more than 120 scientific articles and 10 book chapters.

Patrick Nunn is Professor and Head of School of Behavioural, Cognitive and Social Sciences at the University of New England. His research interests are in Pacific Islands and include Quaternary-to-future climate change, plate-boundary tectonics, geomythology and geoarchaeology. In addition to more than 195 peer-reviewed publications, he has written several books including *Oceanic Islands* (Blackwell, 1994); *Environmental Change in the Pacific Basin* (Wiley, 1999); *Climate, Environment and Society in the Pacific during the Last Millennium* (Elsevier, 2007) and *Vanished Islands and Hidden Continents of the Pacific* (University of Hawai'i Press, 2009). In 2003 he was awarded the Gregory Medal for 'outstanding service to science in the Pacific'.

Frank Oldfield's career spans over 50 years, mostly in UK Universities, with short spells overseas and a five-year period as Executive Director of the IGBP PAGES project in Bern, Switzerland. His research interests have included vegetation history, short-lived radioisotope chronologies, environmental magnetism, the role of human activities in modifying the environment and climate change. He is Emeritus Professor of Geography in the University of Liverpool.

Hermann Österle has been working in Potsdam Institute for Climate Impact Research (Germany) as a scientist in the climate research program since 1993. He graduated from the

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Deborah M. Pearsall is Professor of Anthropology at the University of Missouri. She earned a BA in Anthropology at the University of Michigan, and an MA and PhD at the University of Illinois. She became interested in paleoethnobotany—the study of plant–people interrelationships through archaeology—while an undergraduate, studying with Richard Ford. Graduate work took her to Ecuador, where she participated in Donald Lathrap's excavations at Real Alto. Research interests include the origins of agriculture and phytolith analysis. She is author of *Paleoethnobotany: A Handbook of Procedures* and *Plants and People in Ancient Ecuador: The Ethnobotany of the Jama River Valley*.

Thomas F. Pedersen holds a BSc in Geology from the University of British Columbia (1974) and a PhD in Marine Geochemistry from the University of Edinburgh (1979). Following post-doctoral work at UBC, he joined the faculty of the Department of Oceanography and two decades later moved in 2002 to the University of Victoria to become Head of the School of Earth and Ocean Sciences. He subsequently served as Dean of Science for six years prior to assuming in 2009 the position of Director of the new Pacific Institute for Climate Solutions. Pedersen is internationally recognised for his research in the history of the oceans and the response of the sea to climate change through time, as well as for his work on the geochemical behaviour of submerged mine wastes in the sea and in lakes. He has co-edited two books on global change and published well over 100 scientific papers and book chapters. Among other honours, he was elected to Fellowship in the Royal Society of Canada in 2002 and Fellowship in the American Geophysical Union in 2006.

Elisabetta Pierazzo is a Senior Scientist at the Planetary Science Institute and Adjunct Professor at the Lunar and Planetary Laboratory, University of Arizona. She received a Laurea (equivalent to BS) in Physics from the University of Padua, Italy, in 1988 and a PhD in Planetary Sciences from the University of Arizona in 1997. She has been studying impact cratering and its effects for 15 years, establishing a strong connection with both the impact and climate modelling communities. Her principal research interests are impact cratering on planetary surfaces and the climatic effects of impacts. Her research includes studies of the end-Cretaceous impact that extinguished the dinosaurs, the formation of terrestrial impact structures, and the role of impacts in the origin of life. Dr. Pierazzo has published over 30 technical papers, and edited two conference proceedings. She is currently co-editing a graduate level textbook entitled *Impact Cratering: Processes and Products.*

Neil Rose is Professorial Research Associate in the Environmental Change Research Centre, University College London. His main research interests are in the palaeolimnological records of atmospherically deposited pollutants, particularly in remote areas. He has worked in Svalbard, Greenland, the Antarctic, the Tibetan Plateau and in mountain lakes in the USA, Africa and throughout Europe. More recently his research has also included the impact that these pollutants have on the toxicity of sediments to aquatic biota and the role of climate change in the remobilisation of previously deposited contaminants including their transfer from catchment soils to surface waters. He is appointed Associate Editor of *Journal of Paleolimnology* in 2008.

Alison J. Smith combines her interests in aquatic biology and Quaternary paleoenvironments through the study of nonmarine Quaternary records of hydrologic and climatic change. She applies her expertise in ostracode paleoecology and biogeography to the reconstruction of past histories of aquatic environments throughout North America. She completed her BA in Anthropology at Wheaton College, Massachusetts, and holds the degrees of Master of Philosophy in Archaeology from Cambridge University, Master of Science in Geology from the University of Delaware, and a PhD in Geology from Brown University. She is currently a Professor in the Geology Department at Kent State University in Ohio, where she also holds adjunct faculty status in Biological Sciences. Professor Smith has published 36 technical papers and book chapters, is manager and co-author of the North American Ostracode Database (NANODe), an online database of modern ostracode biogeography and ecology, has served on the American Quaternary Society Council and is currently a member of the US National Committee for INQUA.

Peter W. Stahl is an archaeologist who works in the neotropics with interests in historical ecology, tropical forest ecology, zooarchaeology, vertebrate taphonomy, and Amazonian ethnography. He has participated in field projects throughout the Western Hemisphere and Africa. He received the PhD in Anthropology from the University of Illinois in 1984 and is currently Professor of Anthropology at Binghamton University, State University of New York, Binghamton, NY, USA.

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Pavel E. Tarasov is Assistant Professor at the Institute of Geological Sciences, Free University of Berlin. He graduated from the Moscow State University in 1985, and seven years later received his PhD for the palynological study of the postglacial vegetation and climate dynamics in northern and central Kazakhstan. He was awarded by the Alexander von Humboldt Foundation Fellowship in 2003 and by the three-year Heisenberg-Stipend of the German Research Foundation (DFG) in 2010. Objective reconstructions of Quaternary climate; vegetation and environments; data-model comparisons; and human–environmental interactions are among his main research interests.

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Eugene R. Wahl is physical scientist with the Paleoclimatology Branch of NOAA's National Climatic Data Center. His research focuses on last-2,000-year climate reconstructions for North America and at hemispheric and global scales, including: methods development, characterization and reduction of uncertainty, and experimental examinations of reconstruction quality. Dr Wahl received his PhD from the University of Minnesota, and was postdoctoral fellow and visiting scientist at the National Center for Atmospheric Research, USA. He was Assistant Professor of environmental studies at Alfred University, New York, and is currently Adjunct Graduate Professor of environmental ethics and economics at St. Mary-of-the-Woods College, Indiana, and visiting scientist at the Institute of Mathematics Applied to Geosciences at the National Center for Atmospheric Research.

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Jamie Williams is currently reading for a PhD in Geography at Swansea University. His research interests are historic vegetation responses to climate and how this influences catchment hydrology. He also works for a commercial remote sensing company specialising in data capture and analysis.

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Andrew J. Wiltshire is a climate impacts scientist at the Meteorological Office Hadley Centre. He uses his extensive expertise in land surface modelling to better understand the impacts of climate change and climate variability on global water resources. In particular Andrew's research focuses on the impacts of the secondary drivers of climate change such as the direct CO2 effect on plant water use.

Jamie Wood is a postdoctoral researcher at Landcare Research, New Zealand. His research interests are Quaternary palaeoecology, particularly the integration of multiple techniques

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Xiaoping Yang is Professor at the Institute of Geology and Geophysics, Chinese Academy of Sciences. Most of his research has involved drylands environments and their geological, historical and contemporary changes, specifically geomorphology and paleoclimatology in northern China during the late Quaternary. His ongoing 'desert' projects focus on the two largest sand seas in western China and one typical stabilized dune field in the eastern part of the Asian desert belt. His research work has been published in internationally authoritative magazines and books, and he has served as guest editor for five drylands special issues of internationally reputable journals.

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