PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Preface

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PREFACE

The climate of the Earth has undergone many changes and for those times when geologic data are widespread and abundant the Mesozoic appears to have been one of the warmest intervals. This was a time during which the single continent Pangea disintegrated into continental units similar to those of today, a time when there were no significant polar ice caps and sea level was generally much higher than at the present time, and a time when dinosaurs apparently dominated terrestrial faunas and the flowering plants evolved. Understanding this alien world, ancestral to ours, is intrinsically interesting, intellectually challenging, and offers opportunities for more effective targeting of sites where commercially important geological resources may be found. It also provides critical insights into the operation of coupled Earth systems (biospheric, atmospheric, hydrospheric and geospheric) under extreme 'greenhouse' conditions, and therefore may have relevance to possible future global change.

Our intention in organizing this Discussion Meeting was to bring together those who gather and interpret geologic data with those who model global climates from first principles. The community of workers who study the Quaternary have made significant advances by integrating and comparing palaeodata and climate model experiments. Although we have focused not on the Quaternary 'icehouse' but on the Mesozoic 'hothouse' climate we are well aware that approaches used in the study of the Quaternary may have relevance to earlier times. However, the temporal, and in particular the evolutionary, distance between the Quaternary and the Mesozoic does demand some different methodologies. It is essential that geologists on the one hand, and climate modellers on the other, harbour no misconceptions regarding the power and limitations of each other's approaches to palaeoclimatic reconstruction. The hard geological data – the evidence of what the world climate pattern actually was – is necessarily incomplete geographically, temporally, and with regard to important atmospheric parameters (e.g. clouds). Critical data on mountain heights and roughness may always elude us. Nevertheless, geology can provide surprisingly sensitive and precise quantitative climatic data, and undoubtedly geological interpretation will be widened and made more rigorous in many as yet ill-explored directions. Climate models provide quantitative estimates of an enormous array of climatic variables (temperature, cloudiness, wind strength and direction) at high temporal resolution (daily) and geographic completeness, but currently suffer from inadequate or inappropriate parameterizations, over simplistic algorithms, primitive coupled atmosphere–ocean systems, and technological limitations on computing power. The way forward, it seems to us, to understand climate change process in a form that will be useful for predicting the future, and for understanding the past with its legacy of resources, is to seek a synergistic interaction between those who observe remnant patterns and those who undertake theoretical modelling.

As organizers we learned a great deal from those kind enough to accept our invitations to present papers at the meeting and those who contributed to the discussions. We are most grateful to all who participated. In particular we thank the Royal Society for sponsoring and hosting the meeting, and for enabling us to produce this published record. Our special thanks go to Christine Johnson, Peter Warren, Simon Gribbin and Catherine Brennan for assisting and shepherding us throughout the organizational and publication process.

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