PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Preface for Discussion on Mid–Ocean Ridges: dynamics of processes associated with creation of new ocean crust

J. R. Cann, H. Elderfield and A. Laughton

Phil. Trans. R. Soc. Lond. A 1997 **355**, 215-216
doi: 10.1098/rsta.1997.0006

Preface

The mid-ocean ridge system is the longest continuous feature of the Earth's surface. At the mid-ocean ridges hot mantle rock wells up from 100 km to fill the gaps created as the Earth's tectonic plates move apart. The mantle melts as it rises, and 3 km^2 of new ocean floor are formed each year by the resulting volcanic activity, involving the extrusion of about 2 km^3 per year of lavas, and intrusion of 15 km^3 of magma beneath the ocean floor, with volumes of seafloor volcanism vastly exceeding that of any type of volcano on land. This magmatic activity carries 10% of the total heat loss from the interior of the Earth, a large part of which is picked up by flowing seawater that moves through the rocks of the seafloor. Chemicals as well as heat are extracted by this process from the hot magmatic rocks, leading to spectacular areas of hydrothermal venting on the seabed at the ridge axis forming seafloor sulphide deposits and nourishing specialist biological communities. This process affects (some may say *controls*) ocean chemistry and may impact global climate.

In recent years, the recognition that a major coordinated effort was needed in order to understand the fundamental dynamical processes operating at mid-ocean ridges led the scientific community to mount a series of major national and international programmes. The major UK component of this effort has been the British Mid-Ocean Ridge Initiative (BRIDGE) which was established as a NERC Community research project. At the same time, many other countries developed active programmes in this area of science. Much of the work presented at this Discussion Meeting has been the product of these initiatives. In addition, a poster session held concurrently with the meeting highlighted achievements of the BRIDGE programme.

The 14 papers presented were grouped into four inter-related sessions: melting of the mantle beneath mid-ocean ridges from geophysical and geochemical evidence and modelling; the construction and evolution of oceanic crust at fast and slow spreading centres; nature and evolution of submarine hydrothermal fluids and the associated sulphide deposits; influence of hydrothermal activity on the water column and on biological communities.

What emerges strongly is the necessarily interdisciplinary and cross-disciplinary nature of much of the research. Work in any one scientific discipline has benefited greatly from the interdisciplinary framework of the new research and interdisciplinary links have often been essential in the new developments. It is also clear that many scientific advances have been closely linked to and dependent on technological innovation. Further, it is very clear that the subject is still firmly founded on exploration and observation. Exploration is unfashionable in research these days, though it is always essential in starting new fields. The first hydrothermal vents were discovered less than 20 years ago, so it is not surprising that each new area discovered brings new insights into science. Research vessels, drill ships and submersibles are all an essential part of any advances in the area.

It is sad that the publication of this volume coincides with the end of the UK BRIDGE programme, whose scientists have contributed much to the success of this meeting. A start has been made at understanding some of the major processes associated with the creation of new ocean crust and it is important that the initiative and technological development derived from BRIDGE is exploited, perhaps within

Phil. Trans. R. Soc. Lond. A **355**, 215–216
Printed in Great Britain

a broader framework, to address fundamental scientific problems in ocean sciences. As noted in the Foreword to an early BRIDGE document, the ocean floor makes up two thirds of the surface of the Earth, yet we know less about its shape than we know about the far side of the Moon. Processes in the deep ocean control a large part of the Earth's natural environment, much of which we tacitly rely on for controlling climate and coping with a large variety of wastes. The research there is not just intellectually exciting, but an essential part of understanding our own impact as humans on the Earth.

We thank the speakers for their contributions to this issue and to them and the discussants for their contributions to the Meeting. We thank Dr L. M. Parson for acting as Chairman for one of the sessions and are also most grateful to the Royal Society staff for its organization.

J. R. Cann
H. Elderfield
A. Laughton

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES