

SPECIAL PAPERS IN PALAEOLOGY

Number 12

[Systematics Association Publication No. 9]

1973

**ORGANISMS AND
CONTINENTS THROUGH
TIME**

*A Joint Symposium of the
Geological Society, Palaeontological Association and
Systematics Association*

**PUBLISHED BY
THE PALAEOLOGICAL ASSOCIATION
LONDON**

Price £10.00

SPECIAL PAPERS IN PALAEOLOGY NO. 12

ORGANISMS AND CONTINENTS THROUGH TIME

Methods of assessing relationships
between past and present biologic distributions and the
positions of continents

A SYMPOSIUM VOLUME OF 23 PAPERS

Edited by

N. F. HUGHES

THE PALAEOLOGICAL ASSOCIATION
LONDON

JANUARY 1973

PREFACE

A SYMPOSIUM meeting to discuss the relationship between biological distribution patterns and continental movements was first envisaged by the Council of the Systematics Association. In early 1970 a joint planning committee was formed as follows: Professor P. H. A. Sneath (Chairman), Professor P. C. Sylvester-Bradley and Dr. K. G. McKenzie from the Systematics Association, Dr. W. S. McKerrow and Mr. N. F. Hughes (Secretary) from the Palaeontological Association, Dr. H. W. Ball and Dr. A. G. Smith from the Geological Society. The committee was charged with arranging a joint meeting in Cambridge in December 1971. It was quickly agreed that Recent biologic distributions of organisms have a rapidly decreasing importance for interpretation of past periods as the time-distance from the present day increases. However, to assist in providing a new basis for interpretation of fossil distributions Dr. A. G. Smith undertook to arrange for maps of past periods based on the latest palaeomagnetic evidence to be available to contributors and then to the symposium. Professor Sneath provided a useful memorandum with references on biological models and tests, to guide authors of biological and palaeobiological papers.

The aims of the symposium were then developed in the form of title, subtitle, and headings of the sections which were distributed to contributors with provisional maps. The papers printed in the volume are set out according to this plan, and were given virtually in this arrangement at the meeting.

Section 1: Discussion of the physical criteria for assessing both the position of continents, and the influence of oceans and atmosphere.

Section 2: Methods of assessing recent (and past) biologic distributions. The papers presented supplement the considerable amount of work published elsewhere in the last few years by botanists and zoologists.

Section 3: Comparison of Mesozoic and Tertiary distributions of selected organisms, with continental distributions for the appropriate time as determined from palaeomagnetic evidence. The tectonic plate movements are relatively well known now for Cretaceous, Jurassic, and Triassic time; latitudes quoted for these periods are now fairly certain. There is now therefore a definite possibility of explaining Mesozoic floral and faunal distribution phenomenon.

Section 4: Examination of some more speculative Palaeozoic continental distribution, in the light of palaeobiologic evidence. As explained by Smith, Briden, and Drewry the longitudes positions can be varied, and the fossil distributions can therefore aid selection of the most probable assembly of continental fragments.

Section 5: Conclusions. At the meeting there was considerable discussion in the final session but in the volume the points printed have been placed adjacent to the relevant papers in the other sections.

The symposium meeting was held in Cambridge on 15–17 December 1971 from the Department of Geology; there were about 200 participants. Dr. C. P. Hughes acted as Local Secretary.

Although this symposium, which was for such a project prepared at somewhat short notice, could not expect to provide unlimited new data, the organizers hope that it will stimulate longer-term projects. The idea that at least for the Tertiary and Mesozoic the main lines of palaeogeography of the world are now known, should turn biogeographical study for those eras to much more profitable and precise topics than hitherto. It may become possible to plot migration rather than to search vainly for missing links in any one area; palaeo-latitudes will now become a starting-point rather than a matter for additional speculation. It does not now seem too much to hope that the whole of palaeontological interpretation will be stimulated, and that this symposium will at least play a small part in the process.

N. F. HUGHES

Editor of the Joint Committee

REFERENCES TO THIS VOLUME

It is recommended that reference to the whole or part of this volume be made in one of the following forms, as appropriate:

HUGHES, N. F. (ed.) 1972. Organisms and continents through time: a symposium. *Spec. Pap. Palaeont.* **12**, vi+334 pp.

WILLIAMS, A. 1972. Distribution of brachiopod assemblages in relation to Ordovician palaeogeography. In HUGHES, N. F. (ed.). Organisms and continents through time. *Spec. Pap. Palaeont.*, **12**, 241-269.

CONTENTS

Preface	iii
INTRODUCTION AND PHYSICAL ASPECTS	
Phanerozoic world maps. <i>By</i> A. G. SMITH, J. C. BRIDEN, <i>and</i> G. E. DREWRY (with discussion)	1
Numerical simulation of climate: present, past, and future <i>By</i> YALE MINTZ (reference and discussion)	43
METHODS OF STUDY OF BIOLOGIC DISTRIBUTIONS	
Statistical methods for the study of biogeography. <i>By</i> P. H. A. SNEATH <i>and</i> K. G. MCKENZIE (with discussion)	45
Organic diversity, palaeomagnetism, and Permian palaeogeography. <i>By</i> F. J. VINE (with discussion)	61
Plates and provinciality, a theoretical history of environmental discontinuities. <i>By</i> J. W. VALENTINE	79
Distributional patterns in contemporary terrestrial and marine animals. <i>By</i> A. HALLAM	93
Problems with small islands. <i>By</i> J. D. HOLLOWAY	107
MESOZOIC AND TERTIARY DISTRIBUTIONS	
Systematics and plate tectonics in the spread of marsupials. <i>By</i> C. B. COX	113
The origin and affinities of African mammal faunas. <i>By</i> S. C. CORYNDON <i>and</i> R. J. G. SAVAGE	121
The biogeography of some Cainozoic Ostracoda. <i>By</i> K. G. MCKENZIE	137
Larger foraminifera and seas through time. <i>By</i> F. C. DILLEY	155
Cretaceous Tethyan coral-rudist biogeography related to the evolution of the Atlantic ocean. <i>By</i> A. G. COATES	169
Mesozoic floras. <i>By</i> P. D. W. BARNARD	175
Mesozoic and Tertiary distributions and problems of land-plant evolution. <i>By</i> N. F. HUGHES	189
A history of organic siliceous sediments in oceans. <i>By</i> A. T. S. RAMSAY	199
PALAEOZOIC STUDIES	
Ordovician trilobite distribution and geography. <i>By</i> H. B. WHITTINGTON <i>and</i> C. P. HUGHES	235

Distribution of brachiopod assemblages in relation to Ordovician palaeogeography. <i>By</i> A. WILLIAMS	241
The distribution of Late Palaeozoic floras. <i>By</i> W. G. CHALONER <i>and</i> W. S. LACEY	271
Brachiopod distributions and faunal provinces in the Silurian and Lower Devonian. <i>By</i> L. R. M. COCKS <i>and</i> W. S. MCKERROW	291
An analysis of Devonian goniate distributions. <i>By</i> M. R. HOUSE	305
Devonian coral endemism in eastern North America and its bearing on palaeogeography. <i>By</i> W. A. OLIVER, JR.	319
The distribution of carboniferous goniatite faunas in relation to suggested continental reconstructions for the period. <i>By</i> F. HODSON <i>and</i> W. H. C. RAMSBOTTOM	321
DISCUSSION AND CONCLUSIONS	
Concluding paper. <i>By</i> P. H. A. SNEATH	331