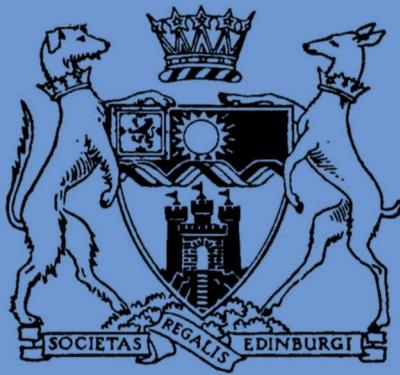


TRANSACTIONS  
OF  
THE ROYAL SOCIETY  
OF  
EDINBURGH



EARTH SCIENCES

Volume 72 (for 1981) Part 4

PUBLISHED BY THE ROYAL SOCIETY OF EDINBURGH  
22 GEORGE STREET · EDINBURGH · EH2 2PQ

1982

## **Editorial Board**

**B. J. BLUCK**  
University of Glasgow

**D. R. BOWES**  
University of Glasgow  
(*Executive Editor*)

**J. B. DAWSON**  
University of Sheffield

**P. McL. D. DUFF**  
University of Strathclyde

**E. H. FRANCIS**  
University of Leeds

**D. GRANT**  
Scottish Academic Press, Edinburgh

**A. M. HOPGOOD**  
University of St Andrews

**R. M. S. SMELLIE**  
*General Secretary*  
Royal Society of Edinburgh

**G. I. LUMSDEN**  
Institute of Geological Sciences, Edinburgh

**D. B. MACINTYRE**  
Pomona College, Claremont

**R. C. MACKENZIE**  
Macaulay Institute, Aberdeen

**D. G. MURCHISON**  
University of Newcastle upon Tyne

**W. MYKURA**  
Institute of Geological Sciences, Edinburgh

**E. K. WALTON**  
University of St Andrews

**C. D. WATERSTON**  
Royal Scottish Museum, Edinburgh  
(*Executive Editor*)

**W. H. RUTHERFORD**  
*Executive Secretary*  
Royal Society of Edinburgh

## **Consulting Editors**

**H. P. BANKS**  
Cornell University, Ithaca

**R. G. C. BATHURST**  
University of Liverpool

**J. M. BERTRAND**  
Université de Nancy

**J. C. BRIDEN**  
University of Leeds

**T. N. CLIFFORD**  
University of the Witwatersrand, Johannesburg

**W. COMPSTON**  
Australian National University, Canberra

**I. W. D. DALZIEL**  
Lamont-Doherty Geological Observatory of  
Columbia University, Palisades

**J. KONTA**  
Charles University, Prague

**R. F. LEGGET**  
Ottawa

**L. B. LEOPOLD**  
University of California, Berkeley

**W. D. MOONEY**  
U.S. Geological Survey, Menlo Park

**M. F. RIDD**  
British National Oil Corporation, Glasgow

**A. SEILACHER**  
Universität Tübingen

**I. J. SELIKOFF**  
Mount Sinai School of Medicine, New York

**D. F. STRONG**  
Memorial University, St Johns

**O. VAN BREEMEN**  
Geological Survey of Canada, Ottawa

**R. H. VERNON**  
Macquarie University, Sydney

**D. E. WHITE**  
U.S. Geological Survey, Menlo Park

**P. A. ZIEGLER**  
Shell Internationale Petroleum Maatschappij B.V.,  
The Hague

*Editorial Secretary*, Royal Society of Edinburgh: C. A. Anderson

**COPYRIGHT:** It is the policy of the Royal Society of Edinburgh not to charge any royalty for the production of a single copy of any one article made for private study or research. Requests for the copying or reprinting of any article for any other purpose should be sent to the Royal Society of Edinburgh.

© 1982 The Royal Society of Edinburgh and the authors of individual papers.

TRANSACTIONS

OF

THE ROYAL SOCIETY OF EDINBURGH:  
EARTH SCIENCES

TRANSACTIONS  
OF  
THE ROYAL SOCIETY  
OF EDINBURGH:  
EARTH SCIENCES

Volume 72

PUBLISHED BY THE ROYAL SOCIETY OF EDINBURGH  
22 GEORGE STREET, EDINBURGH EH2 2PQ

1981

*Printed in Northern Ireland at The Universities Press, (Belfast) Ltd.*