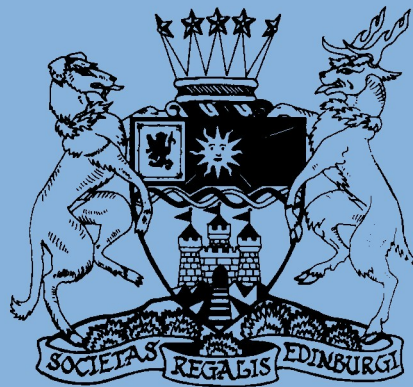


TRANSACTIONS  
OF  
THE ROYAL SOCIETY  
OF  
EDINBURGH



EARTH SCIENCES

Volume 81 Part 3

PUBLISHED BY THE ROYAL SOCIETY OF EDINBURGH

22 GEORGE STREET · EDINBURGH · EH2 2PQ

1990

## Editorial Board

E. N. K. CLARKSON  
University of Edinburgh  
(Chairman)

S. CRAMPIN  
British Geological Survey

C. H. DONALDSON  
University of St Andrews

A. L. HARRIS  
University of Liverpool

B. HARTE  
University of Edinburgh  
(Executive Editor)

J. MCMANUS  
University of St Andrews

C. D. WATERSTON  
General Secretary  
Royal Society of Edinburgh

R. MCQUILLIN  
Britoil plc.

D. M. RAMSAY  
University of Dundee

W. RITCHIE  
University of Aberdeen  
(Executive Editor)

E. K. WALTON  
University of St Andrews

W. DUNCAN  
Executive Secretary

## Consulting Editors

SHOHEI BANNO  
Kyoto University

W. L. BROWN  
Centre de Recherches Pétrographiques et Géo-chimiques,  
Vandoeuvre-les-Nancy

B. W. CHAPPELL  
Australian National University, Canberra

J. M. COLEMAN  
Louisiana State University, Baton Rouge

J. F. DEWEY  
University of Oxford

D. G. GEE  
Lunds Universitet

R. W. HUTCHINSON  
Colorado School of Mines

E. JÄGER  
Universität Bern

J. KONTA  
Charles University, Prague

R. MACDONALD  
University of Lancaster

D. B. MCINTYRE  
Pomona College, Claremont

K. J. MÜLLER  
Rhein. Friedrich-Wilhelms-Universität Bonn

D. F. STRONG  
Memorial University, St Johns

V. C. THAKUR  
Wadia Institute of Himalayan Geology

S. UYEDA  
University of Tokyo

O. VAN BREEMEN  
Geological Survey of Canada, Ottawa

R. WOODALL  
Western Mining Co., Adelaide

*Publications Manager*, Royal Society of Edinburgh: T. Dart

**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. Specific permission will not be required for photocopying multiple copies of copyright material, to be used for *bona fide* educational purposes, provided this is done by a member of the staff of the university, school or other comparable institution, for distribution without profit to student members of that institution and provided the copies are made from the original journal. Requests for the copying or reprinting of any article for any other purpose should be sent to the Royal Society of Edinburgh.

© 1990 The Royal Society of Edinburgh and the authors of individual papers.