

# Himalayan Tectonics: A Modern Synthesis

The Geological Society of London  
**Books Editorial Committee**

**Chief Editor**

RICK LAW (USA)

**Society Books Editors**

JIM GRIFFITHS (UK)

DAN LE HERON (Austria)

MADS HUUSE (UK)

PHIL LEAT (UK)

TERESA SABATO CERARDI (UK)

DANIELA SCHMIDT (UK)

LAUREN SIMKINS (US)

RANDELL STEPHENSON (UK)

ROB STRACHAN (UK)

GABOR TARI (Austria)

MARK WHITEMAN (UK)

**Society Books Advisors**

GHULAM BHAT (India)

MARIE-FRANÇOISE BRUNET (France)

ANNE-CHRISTINE DA SILVA (Belgium)

JASPER KNIGHT (South Africa)

SPENCER LUCAS (USA)

DOLORES PEREIRA (Spain)

VIRGINIA TOY (New Zealand)

GEORG ZELLMER (New Zealand)

**Geological Society books refereeing procedures**

The Society makes every effort to ensure that the scientific and production quality of its books matches that of its journals. Since 1997, all book proposals have been refereed by specialist reviewers as well as by the Society's Books Editorial Committee. If the referees identify weaknesses in the proposal, these must be addressed before the proposal is accepted.

Once the book is accepted, the Society Book Editors ensure that the volume editors follow strict guidelines on refereeing and quality control. We insist that individual papers can only be accepted after satisfactory review by two independent referees. The questions on the review forms are similar to those for *Journal of the Geological Society*. The referees' forms and comments must be available to the Society's Book Editors on request.

Although many of the books result from meetings, the editors are expected to commission papers that were not presented at the meeting to ensure that the book provides a balanced coverage of the subject. Being accepted for presentation at the meeting does not guarantee inclusion in the book.

More information about submitting a proposal and producing a book for the Society can be found on its website: [www.geolsoc.org.uk](http://www.geolsoc.org.uk).

It is recommended that reference to all or part of this book should be made in one of the following ways:

TRELOAR, P.J. & SEARLE, M.P. (eds) 2019. *Himalayan Tectonics: A Modern Synthesis*. Geological Society, London, Special Publications, **483**.

KELLETT, D.A., COTTLE, J.M. & LARSON, K.P. 2018. The South Tibetan Detachment System: history, advances, definition and future directions. In: TRELOAR, P.J. & SEARLE, M.P. (eds) 2019. *Himalayan Tectonics: A Modern Synthesis*. Geological Society, London, Special Publications, **483**, 377–400, <https://doi.org/10.1144/SP483.2>

GEOLOGICAL SOCIETY SPECIAL PUBLICATION NO. 483

# Himalayan Tectonics: A Modern Synthesis

EDITED BY

P. J. TRELOAR  
Kingston University, UK

and

M. P. SEARLE  
University of Oxford, UK

2019  
Published by  
The Geological Society  
London

## THE GEOLOGICAL SOCIETY

The Geological Society of London (GSL) was founded in 1807. It is the oldest national geological society in the world and the largest in Europe. It was incorporated under Royal Charter in 1825 and is Registered Charity 210161.

The Society is the UK national learned and professional society for geology with a worldwide Fellowship (FGS) of over 10 000. The Society has the power to confer Chartered status on suitably qualified Fellows, and about 2000 of the Fellowship carry the title (CGeol). Chartered Geologists may also obtain the equivalent European title, European Geologist (EurGeol). One fifth of the Society's fellowship resides outside the UK. To find out more about the Society, log on to [www.geolsoc.org.uk](http://www.geolsoc.org.uk).

**The Geological Society Publishing House** (Bath, UK) produces the Society's international journals and books, and acts as European distributor for selected publications of the American Association of Petroleum Geologists (AAPG), the Indonesian Petroleum Association (IPA), the Geological Society of America (GSA), the Society for Sedimentary Geology (SEPM) and the Geologists' Association (GA). Joint marketing agreements ensure that GSL Fellows may purchase these societies' publications at a discount. The Society's online bookshop (accessible from [www.geolsoc.org.uk](http://www.geolsoc.org.uk)) offers secure book purchasing with your credit or debit card.

To find out about joining the Society and benefiting from substantial discounts on publications of GSL and other societies worldwide, consult [www.geolsoc.org.uk](http://www.geolsoc.org.uk), or contact the Fellowship Department at: The Geological Society, Burlington House, Piccadilly, London W1J 0BG: Tel. +44 (0)20 7434 9944; Fax +44 (0)20 7439 8975; E-mail: [enquiries@geolsoc.org.uk](mailto:enquiries@geolsoc.org.uk).

For information about the Society's meetings, consult *Events* on [www.geolsoc.org.uk](http://www.geolsoc.org.uk). To find out more about the Society's Corporate Affiliates Scheme, write to [enquiries@geolsoc.org.uk](mailto:enquiries@geolsoc.org.uk).

Published by The Geological Society from:

The Geological Society Publishing House, Unit 7, Brassmill Enterprise Centre, Brassmill Lane, Bath BA1 3JN, UK

The Lyell Collection: [www.lyellcollection.org](http://www.lyellcollection.org)

Online bookshop: [www.geolsoc.org.uk/bookshop](http://www.geolsoc.org.uk/bookshop)

Orders: Tel. +44 (0)1225 445046, Fax +44 (0)1225 442836

The publishers make no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility for any errors or omissions that may be made.

© The Geological Society of London 2019. No reproduction, copy or transmission of all or part of this publication may be made without the prior written permission of the publisher. In the UK, users may clear copying permissions and make payment to The Copyright Licensing Agency Ltd, Saffron House, 6–10 Kirby Street, London EC1N 8TS UK, and in the USA to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA. Other countries may have a local reproduction rights agency for such payments. Full information on the Society's permissions policy can be found at: [www.geolsoc.org.uk/permissions](http://www.geolsoc.org.uk/permissions)

### **British Library Cataloguing in Publication Data**

A catalogue record for this book is available from the British Library.

ISBN 978-1-78620-405-9

ISSN 0305-8719

### **Distributors**

For details of international agents and distributors see:

[www.geolsoc.org.uk/agentsdistributors](http://www.geolsoc.org.uk/agentsdistributors)

Typeset by Nova Techset Private Limited, Bengaluru & Chennai, India

Printed and bound by CPI Group (UK) Ltd, Croydon CR0 4YY

## Dedication

Working in the Himalaya and other remote, and often mountainous, regions of the world involves field based geology which requires significant time away from home. This work is often supported by remarkable partners who care for children and manage the home when the geologists are away. Sometimes, sadly, the geologist never comes home.

This volume is dedicated to all those partners.

In particular Peter Treloar wishes to dedicate this book to his wonderful wife. Pam Nieto was acknowledged in Geological Society Special Publications 74: *Himalayan Tectonics*; 138: *What Drives Metamorphism and Metamorphic Reactions*; and 170: *Tectonics of the Nanga Parbat syntaxis and Western Himalaya*. In each case the

acknowledgment was for allowing her house to be over-run by the paper involved in editing such volumes.

Pam died suddenly and unexpectedly in July 2018, aged just 60, while the editorial work on this book was in full flow. She was engaged with it and fully supportive. Her death slowed the whole process up. She would have been pleased with the final product but, being Pam, would have been proud of the efforts of all the contributors and reviewers as well as those of the GSL team in putting this review volume together.

Pam will be greatly missed, but we must never lose sight of the fact that field geology requires serious sacrifices from our partners.

## Acknowledgements

This volume came out of discussions between Mike Searle and Peter Treloar and some close colleagues. If metrics is the key to analysing the success of a book, then the previous book that we edited together (Treloar, P.J. and Searle, M.P., 1993, *Himalayan Tectonics*, Geological Society of London, Special Publication, 74) was a great success. That particular volume arose out of a Himalaya–Karakoram–Tibet workshop convened by us in Oxford in 1992.

As we both neared retirement it seemed appropriate to revisit the topic matter. Rather than trying to do yet another conference volume, we felt it more exciting to develop an invitation only volume to enable a full coverage of the Himalaya–Karakoram–Tibet region which would have a very strong review component. We are grateful to all of our colleagues who agreed to submit papers to this volume. We trust that ten years down the road the

metrics will look at least as good as they do for the 1993 volume.

We would like to thank Rick Law, the GSL Chief Books Editor, for encouraging us to make a proposal to the Society and Nigel Harris for a supportive, critical review of the proposal. Angharad Hills, then the Commissioning Editor for the GSL Publishing House, helped us through the early stages of the project. Since Angharad's retirement, Bethan Phillips, who took over from her, has been remarkably supportive and efficient and a real pleasure to work with. Rachael Kriefman has done a wonderful job as Production Editor.

We gratefully acknowledge the efforts of the following colleagues and friends who agreed to review manuscripts submitted to this volume. Without their prompt response, publication would have been far less rapid than proved to be the case.

J.C. Aitchison  
T.W. Argles  
R.G. Bilham  
D.W. Burbank  
M.R. Caddick  
R. Carosi  
P.A. Cawood  
S.-L. Chung  
P.G. De Celles  
J.A. DiPietro  
S.W. Faryad  
S. Guillot  
X. Hu  
S. Iaccarino  
A.K. Jain

M.Q. Jan  
D.A. Kellett  
A.K. Laskowski  
R.D. Law  
R. Leary  
J. Lee  
A.H.G. Mitchell  
C.M. Mottram  
P.M. Myrow  
Y. Najman  
R.M. Palin  
R.R. Parrish  
M.G. Petterson  
K. Priestley  
S.M. Rai

H.U. Rehman  
A.H.F. Robertson  
A.C. Robinson  
D.M. Robinson  
S.W. Roecker  
M.P. Searle  
R.C. Thiede  
P.J. Treloar  
S.G. Wesnousky  
D.J.J. Van Hinsbergen  
P. Upton  
J. Wakabayashi  
C.J. Warren