

# GEOLOGICAL MAGAZINE

Volume 157 Issue 1

January 2020

ISSN: 0016-7568

**SPECIAL ISSUE:** Commemorating the 155th anniversary  
of *Geological Magazine*



**CAMBRIDGE**  
UNIVERSITY PRESS

# GEOLOGICAL MAGAZINE

---

## EDITOR-IN-CHIEF

**Professor Peter Clift** *Department of Geology and Geophysics, Louisiana State University, Baton Rouge, LA 70803, USA*  
*pclift@lsu.edu*

## EXECUTIVE EDITORS

**Dr Kathryn Goodenough** *British Geological Survey, The Lyell Centre, Research Avenue South, Edinburgh EH14 4AP, UK*  
*kmgo@bgs.ac.uk*

**Dr Stephen M. Hubbard** *University of Calgary, Department of Geosciences, Calgary, Alberta, Canada*  
*shubbard@ucalgary.ca*

**Professor Olivier Lacombe** *University Pierre et Marie Curie, 4 Place Jussieu, 75005 Paris, France*  
*olivier.lacombe@upmc.fr*

**Dr Bas van de Schootbrugge** *Department of Earth Sciences, Utrecht University, Princetonlaan 8A, 3584 CB Utrecht, The Netherlands*  
*B.vanderSchootbrugge@uu.nl*

## BOOK REVIEW EDITOR

*Please contact the Editorial Office at [geolmag@cambridge.org](mailto:geolmag@cambridge.org)*

---

## EDITORIAL BOARD

**Dr Antonio Álvarez-Valero** *University of Salamanca, Spain*

**Dr Susanne Buiter** *University of Oslo, Norway*

**Dr Stephen Brusatte** *University of Edinburgh, UK*

**Professor Alan Collins** *University of Adelaide, Australia*

**Professor Yildirim Dilek** *Miami University, USA*

**Professor Victoria Ershova** *Saint Petersburg State University, Russian Federation*

**Dr Svetoslav Georgiev** *Colorado State University, USA*

**Dr Jacqueline Halpin** *University of Tasmania, Australia*

**Professor Xian-Hua Li** *Institute of Geology and Geophysics CAS, China*

**Dr Guido Meinhold** *Keele University, UK*

**Dr Sarbani Patranabis-Deb** *Indian Statistical Institute (ISI), Kolkata, India*

**Professor Renata Schmitt** *Universidade Federal do Rio de Janeiro, Brazil*

**Dr Holly Stein** *Colorado State University, USA; CEED, University of Oslo, Norway*

**Dr Hans-Dieter Sues** *Smithsonian National Museum of Natural History, USA*

**Dr Shiming Wan** *Institute of Oceanology, Chinese Academy of Sciences, China*

**Professor Yongdong Wang** *Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, China*

---

The *Geological Magazine* was originally established in 1864 and has been published continuously ever since. It covers the whole field of earth sciences, has a worldwide readership and has a particular strength in providing a niche for interdisciplinary papers and papers that would be of interest to geologists from many different specialities. Papers of any length are considered, provided that the length is justifiable.

The *Magazine* publishes both original and review articles, rapid communications, discussions of papers which have already appeared in the *Magazine*, book reviews and a list of new publications.

There are no page charges for papers published in the *Magazine*.  
© Cambridge University Press 2020

## Internet Access

This journal can be found online at <https://www.cambridge.org/geo>. *Geological Magazine* (ISSN 0016-7568). Twelve parts form a volume in 2020.

**The subscription price** (excluding VAT) of volume 157, 2020, which includes print and electronic access, is £1063 (US \$1808 in USA, Canada and Mexico). The electronic-only price available to institutional subscribers is £827 (US \$1505 in USA, Canada and Mexico). Single parts are £174 net (US \$296 in USA, Canada and Mexico) plus postage. Prices include delivery by air where appropriate. Orders, which must be accompanied by payment, should be sent to any bookseller or subscription agent, or direct to the publisher: Cambridge University Press, The University Printing House, Shaftesbury Road, Cambridge CB2 8BS. Subscriptions in the USA, Canada and Mexico should be sent to Cambridge University Press, Journals Fulfillment Department, One Liberty Plaza, New York, NY 10006. EU subscribers

(outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. Japanese prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan. Periodicals postage paid at New York, NY, and at additional mailing offices. **POSTMASTER:** send address changes in USA, Canada and Mexico to *Geological Magazine*, Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA.

**Copying:** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, Mass. 01923, USA. Organizations in the USA who are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. This consent does not extend to multiple copying for promotional or commercial purposes.

Organizations authorized by the Copyright Licensing Agency may also copy material subject to the usual conditions.

**For all other use**, permission should be sought from Cambridge or the American Branch of Cambridge University Press.

**Claims** for missing issues can only be considered if made immediately after receipt of the subsequent issue.

**Advertising:** Details of advertising in *Geological Magazine* may be obtained from the publisher.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information.