

GEOLOGY

AUGUST 2021 | VOLUME 49 | NUMBER 8

- 883 Controls on the origin and evolution of deep-ocean trench-axial channels**
Adam D. McArthur and Daniel E. Tek
- 889 Transient Permian-Triassic euxinia in the southern Panthalassa deep ocean**
S.E. Grasby, D.P.G. Bond, P.B. Wignall, R. Yin, L.J. Strachan and S. Takahashi
- 894 How Himalayan collision stems from subduction**
M. Soret, K.P. Larson, J. Cottle and A. Ali
- 899 Ghost-dune hollows of the eastern Snake River Plain, Idaho: Their genesis, evolution, and relevance to Martian ghost-dune pits**
David R. Gaylord, Tammy M. Rittenour, Paul K. Link, Brent D. Turrin and Mel A. Kuntz
- 905 Ferric iron triggers greenalite formation in simulated Archean seawater**
Isaac L. Hinz, Christine Nims, Samantha Theuer, Alexis S. Templeton and Jena E. Johnson
- 911 Water transfer to the deep mantle through hydrous, Al-rich silicates in subduction zones**
Jörg Hermann and Shayne Lakey
- 916 Annually resolved sediments in the classic Clarkia lacustrine deposits (Idaho, USA) during the middle Miocene Climate Optimum**
Daianne Höfig, Yi Ge Zhang, Liviu Giosan, Qin Leng, Jiaqi Liang, Mengxiao Wu, Brent Miller and Hong Yang
- 921 Eruption risks from covert silicic magma bodies**
Shane M. Rooyakkers, John Stix, Kim Berlo, Maurizio Petrelli and Freysteinn Sigmundsson
- 926 New statistical quantification of the impact of active deformation on the distribution of submarine channels**
Marco Pizzi, Alexander C. Whittaker, Lidia Lonergan, Mike Mayall and W. Hamish Mitchell
- 931 Mud in sandy riverbed deposits as a proxy for ancient fine-sediment supply**
N. Wysocki and E. Hajek
- 936 Did accretion of the Caribbean oceanic plateau drive rapid crustal thickening in the northern Andes?**
Sarah W.M. George, Brian K. Horton, Cristian Vallejo, Lily J. Jackson and E. Gabriela Gutierrez
- 941 Protogenetic sulfide inclusions in diamonds date the diamond formation event using Re-Os isotopes**
M.G. Pamato, D. Novella, D.E. Jacob, B. Oliveira, D.G. Pearson, S. Greene, J.C. Afonso, M. Favero, T. Stachel, M. Alvaro and F. Nestola
- 946 Paleozoic evolution of crustal thickness and elevation in the northern Appalachian orogen, USA**
Ian W. Hillenbrand and Michael L. Williams
- 952 Subduction of the Izanagi-Pacific Ridge—transform intersection at the northeastern end of the Eurasian plate**
Toru Yamasaki, Gen Shimoda, Kenichiro Tani, Jinichiro Maeda and Futoshi Nanayama
- 958 Enhanced Quaternary exhumation in the Namche Barwa syntaxis, eastern Himalaya**
Rong Yang, Frédéric Herman, Ting Liu, Rabiul Haque Biswas, Maria Giuditta Fellin, Yuntao Tian, Junfeng Gong, Ruohong Jiao, Colin Maden and Hanlin Chen
- 963 Confirmation of slow Ti diffusion in quartz by diffusion couple experiments and evidence from natural samples**
Andreas Audétat, Nobuyoshi Miyajima, Dorothea Wiesner and Jean-Nicolas Audinot
- 968 Nonlinear fault damage zone scaling revealed through analog modeling**
Sylvain Mayolle, Roger Soliva, Stéphane Dominguez, Christopher Wibberley and Yannick Caniven
- 973 Climatically driven instability of marine methane hydrate along a canyon-incised continental margin**
Richard J. Davies, Miguel Ángel Morales Maqueda, Ang Li and Mark Ireland
- 978 History of the Larsen C Ice Shelf reconstructed from sub-ice shelf and offshore sediments**
J.A. Smith, C.-D. Hillenbrand, C. Subt, B.E. Rosenheim, T. Frederichs, W. Ehrmann, T.J. Andersen, L. Wacker, K. Makinson, P. Anker, E.J. Venables and K.W. Nicholls
- 983 Diapiric relamination of the Orocopia Schist (southwestern U.S.) during low-angle subduction**
James B. Chapman
- 988 The interfacial energy penalty to crystal growth close to equilibrium**
Fred Gaidies and Freya R. George
- 993 Diverse marine fish assemblages inhabited the paleotropics during the Paleocene-Eocene thermal maximum**
Sanaa El-Sayed, Matt Friedman, Tarek Anan, Mahmoud A. Faris and Hesham Sallam
- 999 Immediate temperature response in northern Iberia to last deglacial changes in the North Atlantic**
J.L. Bernal-Wormull, A. Moreno, C. Pérez-Mejías, M. Bartolomé, A. Aranburu, M. Arriolabengoa, E. Iriarte, I. Cacho, C. Spötl, R.L. Edwards and H. Cheng
- 1004 Widespread glacial erosion on the Scandinavian passive margin**
Vivi K. Pedersen, Åsne Rosseland Knutsen, Gustav Pallisgaard-Olesen, Jane Lund Andersen, Robert Moucha and Ritske S. Huismans
- 1009 A hidden Rodinian lithospheric keel beneath Zealandia, Earth's newly recognized continent**
R.E. Turnbull, J.J. Schwartz, M.L. Fiorentini, R. Jongens, N.J. Evans, T. Ludwig, B.J. McDonald and K.A. Klepeis
- 1015 Clay minerals modulate early carbonate diagenesis**
N. Tanner Mills, Julia S. Reece and Michael M. Tice
- 1020 Pityusa Patera, Mars: Structural analyses suggest a mega-caldera above a magma chamber at the crust-mantle interface**
Hannes Bernhardt and David A. Williams

GEOLOGY

GEOLOGY publishes timely, innovative, and provocative articles relevant to its international audience, representing research from all fields of the geosciences.

GEOLOGY (ISSN 0091-7613 USPS 994-580 CODEN GLGYB) is published monthly by the Geological Society of America, Inc. (GSA), with offices at 3300 Penrose Place, Boulder, Colorado, USA. Mailing address is P.O. Box 9140, Boulder, CO 80301-9140, USA. Periodicals postage paid at Boulder, Colorado, and at additional mailing offices. Postmaster: Send address changes to Geology, Sales & Service, P.O. Box 9140, Boulder, CO 80301-9140, USA.

Copyright © 2021, The Geological Society of America, Inc. (GSA). All rights reserved. Copyright not claimed on content prepared wholly by U.S. government employees within the scope of their employment. Individual scientists are hereby granted permission, without fees or further requests to GSA, to use a single figure, a single table, and/or a brief paragraph of text in other subsequent works and to make unlimited photocopies of items in this journal for noncommercial use in classrooms to further education and science. In addition, an author has the right to use his or her article or a portion of the article in a thesis or dissertation without requesting permission from GSA, provided the bibliographic citation and the GSA copyright credit line are given on the appropriate pages. For any other form of capture, reproduction, and/or distribution of any item in this journal by any means, contact: Permissions, GSA, P.O. Box 9140, Boulder, CO 80301-9140, USA, fax +1-303-357-1073, editing@geosociety.org; reference Geology, ISSN 0091-7613. Permission is granted to authors to post the abstracts only of their articles on their own or their organization's Web site providing the posting includes this reference: "The full paper was published in the Geological Society of America's journal Geology, [include year, month, and page numbers, if known, where the article appears or will appear]."

GSA provides this and other forums for the presentation of diverse opinions and positions by scientists worldwide, regardless of their race, citizenship, gender, religion, sexual orientation, or political viewpoint. Opinions presented in this publication do not reflect official positions of the Society.

SUBSCRIPTIONS for 2021 calendar year. All GSA Members receive free online access to Geology with their membership. Prices for print subscriptions: Members and Fellows: \$99; Student, K–12 Teacher, and Early Career Professional Members: \$60. Nonmembers and institutions: \$1,375 (print + online). Details on subscription choices, formats, and pricing at www.geosociety.org/publications/. For all orders, call GSA Sales & Service at +1.888.443.4472 or +1.303.357.1000, or e-mail gsaservice@geosociety.org. Claims: for nonreceipt or damaged copies, please contact GSA Sales & Service. Claims are honored for one year; please allow sufficient delivery time (up to 8 weeks) for overseas copies.

GSA ONLINE

Organization home page: www.geosociety.org
Journals and books: www.gsapubs.org
Manuscript submission: <https://geology.msubmit.net>

EDITORS

Kathleen C. Benison
West Virginia University
Kathleen.Benison@mail.wvu.edu

Chris Clark
Curtin University
geologyscienceeditor@curtin.edu.au

William Clyde
University of New Hampshire
Will.Clyde@unh.edu

Gerald Dickens
Trinity College Dublin
DICKENSG@tcd.ie

Marc D. Norman
Australian National University
marc.norman@anu.edu.au

Urs Schaltegger
University of Geneva
urs.schaltegger@unige.ch

GEOLOGY STAFF

Director of Publications
Jeanette Hammann

Managing Editor
Lyne Yohe
lyohe@geosociety.org

Editorial Staff
Jennifer Olivarez
jolivarez@geosociety.org

GSA OFFICERS

Executive Director
Vicki S. McConnell

President
Barbara L. Dutrow

President-Elect
Mark Gabriel Little

Past President
J. Douglas Walker

Treasurer
Richard C. Berg

EDITORIAL BOARD

2019–2021
John Cottle
Jacob A. Covault
Elena Druguet
Paul Kapp
Shoufa Lin
Jonas B. Ruh
J. Gregory Shellnut
Martine Simoes
Zoltán Sylvester
An Yin

2020–2022
Olivier Bachmann
Whitney Behr
Carolyn Boulton
Matthew E. Clapham
Aaron Diefendorf
Dong Feng
Sam Johnstone
Meredith A. Kelly
Marcelo Ketzner
Li-Wei Kuo
Sergio Llana-Fúnez
Andrew J. Parsons
Oliver Plümpner
Maria Seton
Ron Steel
Lucie Tajcmanova
Paola Vannucchi
Malcolm W. Wallace

2021–2023
Michael Blum
Giovanni Camanni
Hsin-Hua Huang
Micha Ruhl
Justin Strauss
Michael Taylor

COUNCILORS

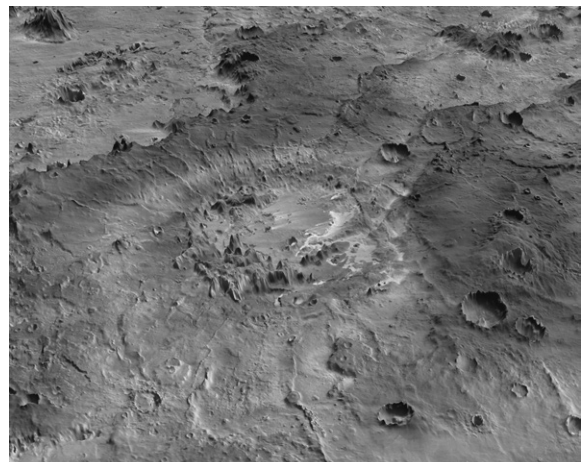
2018–2022
Wendy A. Bohrson
Nathan A. Niemi
Jeff N. Rubin

2019–2023
Margaret Eggers
Katharine W. Huntington
Glenn Thackray

2020–2024
Madeline E. Schreiber
Susan G. Stover
Manfred R. Strecker

2021–2025
J. Wright Horton Jr.
Jean Hsieh
Donna Jurdy

GSA Student Advisory Council Chair
Rebecca A. Taormina



COVER: An ~450-km-wide, southwest-looking perspective view of Pityusa Patera in the Malea Planum region, southwest of Hellas Planitia, on Mars. The 20-fold height-exaggerated, blended digital terrain model from is from data from the Mars Orbiter Laser Altimeter and High Resolution Stereo Camera over a daytime mosaic by the Thermal Emission Imaging System. White and red colors show high elevations, yellow and green colors show lower elevations. See "Pityusa Patera, Mars: Structural analyses suggest a mega-caldera above a magma chamber at the crust-mantle interface" by Bernhardt and Williams, p. 1020–2024.

Photo by: