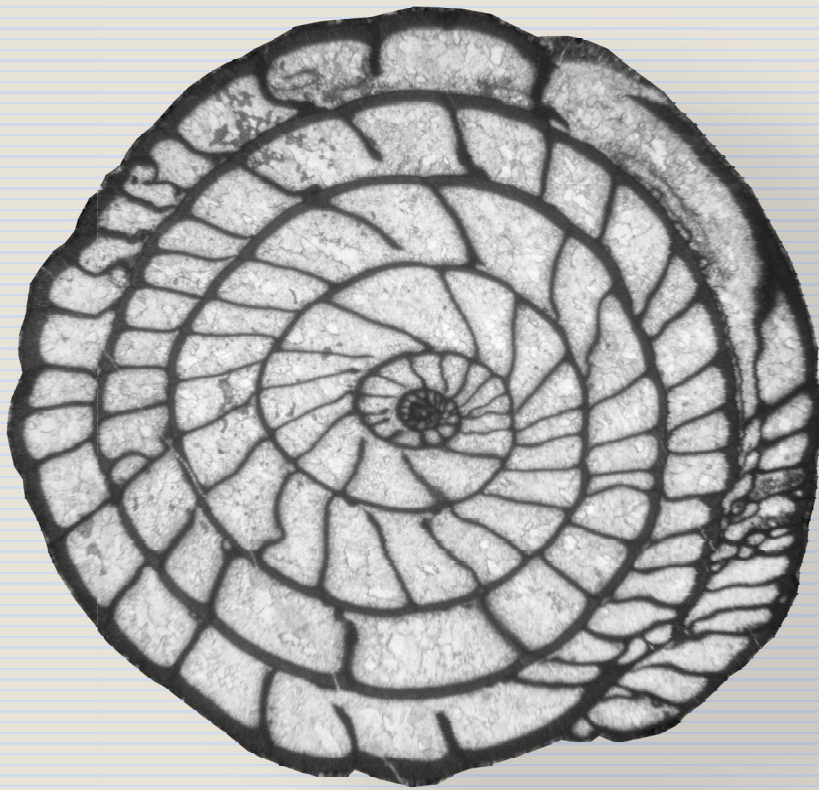


JOURNAL of PALEONTOLOGY



VOL 90 | NO 6 | 2016



CAMBRIDGE
UNIVERSITY PRESS



OFFICERS AND EDITORS OF THE PALEONTOLOGICAL SOCIETY



- President*
STEVE HOLLAND,
Univ. of Georgia
stratum@uga.edu
- President-Elect*
ARNOLD I. MILLER,
Univ. of Cincinnati
Arnold.miller@uc.edu
- Past President*
SANDRA J. CARLSON,
Univ. of California–Davis
sjcarlson@ucdavis.edu
- Secretary*
MARGARET M. YACOBUCCI,
Bowling Green State Univ.
mmyacob@bgsu.edu
- Treasurer*
PETER J. HARRIES,
North Carolina State
pjharrie@ncsu.edu
- JP Editors*
BRENDA R. HUNDA,
Cincinnati Museum Center
BHunda@cincymuseum.org
- JISUO JIN,
Univ. of Western Ontario
jjin@uwo.ca
- JP Managing Editor*
SARA A. MARCUS,
journalofpaleontology@cambridge.org
- JP Associate Editors*
NICHOLAS BUTTERFIELD,
Cambridge Univ.
- STYLIANOS CHATZIMANOLIS,
Univ. Tennessee–Chattanooga
- TOM CRONIN,
USGS
- WILLIAM A. DiMICHELE,
Smithsonian Institution
- ROBERT J. ELIAS,
Univ. of Manitoba
- NADIA FRÖBISCH,
Museum für Naturkunde
- FOREST J. GAHN,
Brigham Young Univ., Idaho
- JOSEPH HANNIBAL,
Cleveland Museum of Natural History
- PETER J. HARRIES,
North Carolina State
- JOACHIM HAUG,
Univ. of Greifswald
- MICHAEL HAUTMANN,
Univ. of Zurich
- MARTIN J. HEAD,
Brock Univ.
- SAMANTHA HOPKINS,
Univ. of Oregon
- NIGEL HUGHES,
UC Riverside
- DANIEL KSEPKA,
Bruce Museum
- MAX LANGER,
Universidade de São Paulo
- STEPHEN A. LESLIE,
James Madison Univ.
- BRUCE LIEBERMAN,
Univ. of Kansas
- STEVEN LoDUCA,
Eastern Michigan Univ.
- RICK LUPIA,
Oklahoma Museum
- GABRIELA MÁNGANO,
Univ. Saskatchewan
- MALGORZATA MOCZYDLOWSKA-
VIDAL, Uppsala Univ.
- ALISON MURRAY,
Univ. of Alberta
- PAULA NOBLE,
Univ. of Nevada
- BRIAN PRATT,
University of Saskatchewan
- IMRAN RAHMAN,
Oxford University Museum of Natural
History, England
- ERIC SCOTT,
John D. Cooper Center
- MARY SILCOX,
Univ. of Toronto Scarborough
- HANS-DIETER SUES,
Smithsonian Institution
- COLIN SUMRALL,
Univ. of Tennessee
- LEIF TAPANILA,
Idaho State Univ.
- DAVID VARRICCHIO,
Montana State Univ.
- PETER WAGNER,
Smithsonian Institution
- STEVE WESTROP,
Oklahoma Museum
- DAVID M. WORK,
Maine State Museum
- PATRICK WYSE JACKSON,
Trinity College Dublin
- MARGARET M. YACOBUCCI,
Bowling Green State Univ.
- SAMUEL ZAMORA,
Geological Survey of Spain
- RENBIN ZHAN,
Nanjing Institute of Geology and
Palaeontology,
Chinese Academy of Sciences
- Paleobiology Senior Editor*
CATHERINE BADGLEY,
Univ. of Michigan
- Paleobiology Co-Editors*
CARLOS A. JARAMILLO,
Smithsonian Tropical Research
Institute
- MICHAEL KOWALEWSKI,
Univ. of Florida
- SHUHAI XIAO,
Virginia Polytechnic Institute
- Editor of Special Publications*
SARA A. MARCUS,
Reno, NV
mapmarc2004@sbcglobal.net
- Communications Officer*
LEIF TAPANILA,
Idaho State Univ.
tapleif@isu.edu
- Program Coordinator*
MATTHEW CLAPHAM
Univ. of California, Santa Cruz
mclapham@ucsc.edu
- Education/Outreach Coordinator*
MARGRET FRAISER,
Univ. of Wisconsin,
Milwaukee
mfracraiser@uwm.edu
- Councilors*
LAUREL COLLINS,
Florida International Univ.
collinsl@fiu.edu
- KATE BULINSKI,
Bellarmine University
kbulinski@bellarmine.edu
- Student Representative*
LUCY CHANG,
Univ. California, Berkeley
luchang@berkeley.edu
- SHARON McMULLEN,
Univ. of Wisconsin–Madison
skmcmullen@wisc.edu
- Section Chairs*
Cordilleran:
NICOLE BONUSCO,
CA State Univ. Fullerton
nbonuso@fullerton.edu
- North Central:
REBECCA FREEMAN,
Univ. of Kentucky
rebecca.freeman@uky.edu
- Northeastern:
ALEXANDER J. BARTHOLOMEW,
SUNY–New Paltz
barthola@newpaltz.edu
- Rocky Mountain:
LEIF TAPANILA,
Idaho State Univ.
tapaleif@isu.edu
- Southeastern:
CHRISTY VISAGGI,
Georgia State Univ.
cvisaggi@gsu.edu
- Editor – Priscum*
MATT POWELL,
Juniata College
powell@juniata.edu
- Editor – Social Media*
PHOEBE COHEN,
Williams College
Phoeb.A.Cohen@williams.edu

Cover illustration: The fusulinoid *Sphaeroschwagerina carniolica* from the Lower Permian of the Karavanke Mountains, Slovenia. Oblique section through proloculus. Kossovaya et al., Fig. 6.9.

ISSN 0022-3360

Copyright © 2016 The Paleontological Society. All rights reserved.

SUBSCRIPTION INFORMATION

The Journal of Paleontology [ISSN 0022-3360] is published bimonthly (January, March, May, July, September, and November) by Cambridge University Press for the Paleontological Society. Members of the Paleontological Society automatically receive electronic subscriptions to the *Journal of Paleontology* and *Paleobiology* as a benefit of membership. Institutional subscriptions can be purchased direct from Cambridge University Press or through any major subscription agent. Print-only, online-only and bundled print and online prices are all available, and subscription prices are tiered according to institution type and size.

Please contact Cambridge University Press for further details:

For customers in North America

Email: subscriptions_newyork@cambridge.org;

Phone: (800) 872-7423, option 4

For customers outside of North America

Email: journals@cambridge.org;

Phone: +44 (0)1223-32-6070; Fax: +44 (0)1223-32-5150

Downloads of individual articles are available on <http://journals.cambridge.org/JPA>.

Reprints of individual articles may be ordered. For information on reprints, please contact Cambridge University Press.

Archives of previous issues are available on <http://journals.cambridge.org/JPA>.

Permissions All rights reserved. Permissions and reproduction policies, request forms, and contacts are available at: <http://www.cambridge.org/uk/information/rights/permission.htm>

ADVERTISING

To advertise in the journal please email USAdSales@cambridge.org or telephone +1(212) 337-5053 in the USA, Canada, or Mexico; email ad_sales@cambridge.org or telephone +44 (1223) 325083 in the rest of the world.

ABSTRACTING AND INDEXING

Articles published in the *Journal of Paleontology* are indexed by De Gruyter Saur, EBSCOhost, Elsevier BV, Gale, GeoScienceWorld, MetaPress, National Library of Medicine, Ovid, ProQuest, and Thomson Reuters.

POSTAL INFORMATION

Periodicals postage rate paid at New York, NY, and at additional mailing offices. POSTMASTER: Send address changes in the USA, Canada, and Mexico to: *Journal of Paleontology*, Cambridge University Press, Journals Fulfillment Department, One Liberty Plaza, 20th Floor, New York, NY 10006. Send address changes elsewhere to the *Journal of Paleontology*, Cambridge University Press, Journals Fulfillment Department, UPH, Shaftesbury Road, Cambridge CB2 8BS, England.

Copyright © 2016 The Paleontological Society. All rights reserved.

Printed in the United States of America