

JOURNAL ^{OF} PALEONTOLOGY



VOL 85 ■ NO 4 ■ JULY 2011 ■ THE PALEONTOLOGICAL SOCIETY



OFFICERS AND EDITORS OF THE PALEONTOLOGICAL SOCIETY



President

PHILIP D. GINGERICH, Museum of Paleontology,
The University of Michigan
Ann Arbor, MI 48109-1079
gingeric@umich.edu

President-Elect

SANDRA J. CARLSON, Geology Department
Univ. California-Davis
One Shields Avenue
Davis, CA 95616-8605
sjcarlson@ucdavis.edu

Past President

DOUGLAS H. ERWIN, Department of Paleobiology
Smithsonian Institution, Washington, DC 20013-7012
erwind@si.edu

Secretary

LISA E. PARK
Department of Geology and Environmental Sciences
University of Akron
Akron, OH 44325-4101
lepark@uakron.edu

Treasurer

ROY E. PLOTNICK
Department of Earth and Environmental Sciences
University of Illinois at Chicago
845 West Taylor Street
Chicago, IL 60607
plotnick@uic.edu

JP Editors

BRIAN R. PRATT, Univ. Saskatchewan
brianpratt@usask.ca
BRIAN T. HUBER, Smithsonian Institution
huberb@si.edu

JP Production Editor

KATHLEEN HUBER, Vienna, VA
jpaleo@si.edu

JP Associate Editors

JASON S. ANDERSON, Univ. of Calgary
janders@ucalgary.ca
LAURIE C. ANDERSON, Louisiana State Univ.
laurie@geol.lsu.edu
TOMASZ BAUMILLER, Univ. of Michigan
tomaszb@umich.edu
ROBERT L. CARROLL, McGill Univ.
robert.carroll@mcgill.ca

KEITH DEWING, Geological Survey of Canada
kdewing@NRCan.gc.ca

WILLIAM A. DIMICHELE, Smithsonian Institution
dimichel@si.edu

ROBERT J. ELIAS, Univ. of Manitoba
eliasrj@Ms.Umanitoba.CA

MICHAEL ENGEL, Univ. of Kansas
msengel@ku.edu

CYNTHIA GORDON, Univ. of Oklahoma
cindyg@ou.edu

JOHN R. GROVES, Univ. of Northern Iowa
John.Groves@uni.edu

STEVEN J. HAGEMAN, Appalachian State Univ.
hagemansj@appstate.edu

JOSEPH HANNIBAL, Cleveland Museum of
Natural History
jhannibal@cmnh.org

PETER J. HARRIES, Univ. of South Florida
harrises@chuma.cas.usf.edu

MARTIN J. HEAD, Brock Univ.
mjhead@brocku.ca

ERIC HILTON, Field Museum of Natural History
ehilton@fieldmuseum.org

HELEN JAMES, Smithsonian Institution
jamesh@si.edu

ED LANDING, New York State Museum
elanding@mail.nysed.gov

STEPHEN A. LESLIE, James Madison Univ.
lesliesa@jmu.edu

BRUCE LIEBERMAN, Univ. of Kansas
blieber@ku.edu

RICK LUPIA, OK Museum
rlupia@ou.edu

MIKE MELCHIN, St. Francis Xavier Univ.
mmelchin@stfx.ca

ERIC SCOTT, San Bernardino Co. Museum
escott@sbcm.sbcounty.gov

MARY SILCOX, Univ. of Toronto Scarborough
msilcox@utsc.utoronto.ca

HANS-DIETER SUES, Smithsonian Institution
suesh@si.edu

COLIN SUMRALL, Univ. of Tennessee
csumrall@utk.edu

JAMES SPRINKLE, Univ. of Texas
echino@mail.utexas.edu

DAVID VARRICCHIO, Montana State Univ.
djv@montana.edu

STEVE WESTROP, OK Museum
swestrop@ou.edu

MICHAEL WOODBURN, UC Riverside
mikew@npgcable.com

DAVID M. WORK, Maine State Museum
david.work@maine.gov

Paleobiology Co-Editors

BRUCE MACFADDEN, DOUGLAS JONES, and
JOHNATHAN BLOCH, Univ. of Florida

Editor of Special Publications

SANKAR CHATTERJEE, Texas Tech Univ.
sankar.chatterjee@ttu.edu

Editor of Priscum

PHILIP NOVACK-GOTTSHALL, Benedictine Univ.
pnovack-gottshall@ben.edu

Program coordinator

THOMAS OLSZEWSKI, Texas A&M Univ.
tomo@geo.tamu.edu

Education Coordinator

MARGARET M. YACOBACCI, Bowling Green State Univ.
mmyacob@bgsu.edu

Councilors

BRENDA R. HUNDA, Cincinnati
bhanke@cincymuseum.org

LINDA IVANY, Syracuse Univ.
lvany@sy.edu

Student Representatives

N. RYAN MCKENZIE, UC Riverside
neil.mckenzie@email.vcr.edu

Section Chairs

Cordilleran: STEPHEN A. SCHELLENBERG,
San Diego Univ., sshell@geology.sdsu.edu

North-Central: KAREN KOY, Western State Univ.
kkoy@missouriwestern.edu

Northeastern: SEAN R. CORNELL,
Shippensburg Univ., srcornell@ship.edu

Rocky Mountain: FOREST J. GAHN,
Brigham Young Univ.-Idaho, ghanf@byui.edu

Southeastern: RONALD D. LEWIS, Auburn Univ.
lewisrd@auburn.edu

Cover illustration: *Halobia tozeri* n. sp. from the Upper Triassic of northeast British Columbia.

The JOURNAL OF PALEONTOLOGY (ISSN 0022-3360) is published bimonthly by The Paleontological Society, 810 E 10th St, Lawrence, KS 66044 USA. Periodical postage paid at Lawrence, Kansas. Postmaster: Send address changes to JOURNAL OF PALEONTOLOGY Subscriptions Office, PO Box 1897, 810 E 10th St, Lawrence, KS 66044-8897, USA. Membership in The Paleontological Society, including electronic subscriptions to the *Journal of Paleontology* and *Paleobiology*, costs \$50 per year. For print subscriptions and other options, please see membership application, available at <http://www.paleosoc.org/>. JP Institutional Subscription price is \$330 per year. For information on prices of back issues of the JOURNAL, please contact: SEPM Business Office, 1731 E 71st St, Tulsa, OK 74136-5108 for volumes 1 (1927) through 59 (1985) or The Paleontological Society Business Office, PO Box 1897, 810 E 10th St, Lawrence, KS 66044-8897 for volumes 60 (1986) and following.

Communication about the JOURNAL, notices, subscriptions, rates, changes of address, and nonreceipt of preceding numbers should be addressed to: JOURNAL OF PALEONTOLOGY Subscriptions Office, PO Box 1897, 810 E 10th St, Lawrence, KS 66044-8897, USA fax: (785)843-1274, jps@allenpress.com. Claims for nonreceipt of preceding numbers must be submitted within three months (six months if foreign) of the date of publication in order to be filled gratis. Communication about membership and requests for blanks for nomination of new members in The Paleontological Society should be directed to the Secretary, Lisa E. Park, address above.

Submit manuscripts online at <http://journalofpaleontology.allenpress.com>.

The JOURNAL OF PALEONTOLOGY is printed offset by Allen Press, Inc., Lawrence, KS 66044.

Copyright © 2011 The Paleontological Society
ALLEN PRESS, INC., LAWRENCE, KS

Visit The Paleontological Society website at paleosoc.org

COPYRIGHT STATEMENT

The appearance of the code at the top of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use, or for the personal and internal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per-copy fee through the Copyright Clearance Center, Inc., PO Box 765, Schenectady, NY 12301 for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Ⓢ This paper meets the requirements of ANSI/NISO Z39.48-1992 (Permanence of Paper).