# **Paleobiology Letters - Rapid Communication** Horses in the Cloud: big data exploration and mining of fossil and extant *Equus* (Mammalia: Equidae) 1 Bruce J. MacFadden and Robert P. Guralnick Featured Article 15 Herbivorous dinosaur jaw disparity and its relationship to extrinsic evolutionary drivers Jamie A. MacLaren, Philip S. L. Anderson, Paul M. Barrett, and Emily J. Rayfield Articles Evolutionarily distinct "living fossils" require both lower speciation and lower extinction rates 34 Dominic J. Bennett, Mark D. Sutton, and Samuel T. Turvey Comparing cal3 and other a posteriori time-scaling approaches in a case study with the 49 pterocephaliid trilobites David W. Bapst and Melanie J. Hopkins Character selection and the quantification of morphological disparity 68 Bradley Deline and William I. Ausich The impact of geographic range, sampling, ecology, and time on extinction risk in the 85 volatile clade Graptoloida James Boyle, H. David Sheets, Shuang-Ye Wu, Daniel Goldman, Michael J. Melchin, Roger A. Cooper, Peter M. Sadler, and Charles E. Mitchell Tooth occlusal morphology in the durophagous marine reptiles, Placodontia (Reptilia: Sauropterygia) 114 Stephanie B. Crofts, James M. Neenan, Torsten M. Schever, and Adam P. Summers Phylogenetic variation in hind-limb bone scaling of flightless theropods 129 Nicholas R. Chan Inferring flight parameters of Mesozoic avians through multivariate analyses of forelimb elements 144 in their living relatives Francisco J. Serrano, Paul Palmqvist, Luis M. Chiappe, and José L. Sanz



# PALEOBIOLOGY

#### EDITORS

Catherine Badgley, Senior Editor, University of Michigan, USA
Carlos A. Jaramillo, Smithsonian Tropical Research Institute, Panama
Wolfgang Kiessling, Friedrich-Alexander University of Erlangen-Nürnberg, Germany
Mark Patzkowsky, Pennsylvania State University, USA
Shuhai Xiao, Virginia Polytechnic Institute, USA

#### OUTGOING EDITOR

Michal Kowalewski, Florida Museum of Natural History, USA

#### ASSOCIATE EDITORS

Martin Aberhan, Museum für Naturkunde Berlin, Germany Paul Barrett, Natural History Museum, London, UK Kevin Boyce, Stanford University, USA Julia Clarke, University of Texas, USA James Crampton, GNS Science, New Zealand Kristina Curry Rogers, Macalester College, USA John Finarelli, University College Dublin, Ireland David L. Fox, University of Minnesota, USA Anjali Goswami, University College London, UK Jason Head, University of Cambridge, UK Cynthia Looy, University of California Berkeley, USA Mark D. Uhen, George Mason University, USA

## MANAGING EDITOR:

Sara A. Marcus, Reno, Nevada, USA, paleobiology@cambridge.org

## FOUNDING EDITORS:

Thomas J. M. Schopf and Ralph G. Johnson



## MEMBERSHIP INFORMATION

Members of the Paleontological Society automatically receive electronic subscriptions to *Paleobiology* and the *Journal of Paleontology* as a benefit of membership. To apply for individual membership, please go to the Paleontological Society's homepage at http://paleosoc.org/, where links to an electronic application, a printable paper application form, and a complete list of membership benefits are provided under the Membership heading.

The Patrons Fund was established to broaden the basis of financial support for *Paleobiology* and thus to encourage paleontological publication.

The Paleontological Society gratefully acknowledges the following Patrons of *Paleobiology*:

To become a Patron, send a check payable to *Paleobiology* to:

Paleobiology Patrons Fund The Paleontological Society P.O. Box 9044 Boulder, CO 80301-9044

## PALEOBIOLOGY PATRONS

RICHARD P. ALVORD MARIE-PIERRE AUBRY GERALD S. BALES RICHARD K. BAMBACH ANNA K. BEHRENSMEYER DAVID S. BERMAN DAVID J. BOTTJER SANDRA J. CARLSON WILLIAM A. CLEMENS PAULO CUSTODI EDWARD B. DAVIS WILLIAM A. DIMICHELE RUSSELL ENGELMAN **ULF ERGANDER** DOUGLAS H. ERWIN DAVID E. FASTOVSKY KARL W. FLESSA MICHAEL J. FOOTE IN MEMORY OF STEPHEN J. GOULD JOHN C. HANDLEY JOHN A. HARPER CAROLE S. HICKMAN STEWART HOLLINGSWORTH JOHN R. HORNER FREDERICK H. C. HOTCHKISS **AUGUST ILG** JEREMY B. C. JACKSON SUSAN M. KIDWELL BRUCE S. LIEBERMAN DAVID R. LINDBERG ALAN R. LORD ERNEST L. LUNDELIUS BRUCE J. MacFADDEN HARUYOSHI MAEDA EDWARD S. MATALKA GEORGE R. McGHEE DAVID L. MEYER ARNOLD I. MILLER WILLIAM C. MILLER, III KEVIN PADIAN RANDY R. PATRICK MARK E. PATZKOWSKY DAVID L. RODLAND IN MEMORY OF TOM SCHOPF ELIZABETH C. SEASTRUM JAMES SPRINKLE WARREN STINE GARY E. STRATHEARN JACEK K. SULANOWSKI SHERMAN SUTER ROGER D. K. THOMAS **BRUCE H. TIFFNEY** JAMES W. VALENTINE GEERAT J. VERMEIJ SALLY E. WALKER RON F. WASZCZAK PETER WILF SCOTT L. WING

XINGLIANG ZHANG

## SUBSCRIPTION INFORMATION

Paleobiology [ISSN 0094-8373] is published four times a year (February, May, August, and November) by Cambridge University Press for the Paleontological Society. Members of the Paleontological Society automatically receive electronic subscriptions to Paleobiology and the Journal of Paleontology 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 https://www.cambridge.org/core/journals/paleobiology.

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

Archives of previous issues are available on https://www.cambridge.org/core/journals/paleobiology.

**Permissions** All rights reserved. Permissions and reproduction policies, request forms, and contacts are available at: http://www.cambridge.org/about-us/rights-permissions/

#### **ADVERTISING**

To advertise in the journal please contact M. J. Mrvica Associates, 2 West Taunton Avenue, Berlin, NJ 08009; Phone: 856-768-9360; Fax: 856-753-0064; Email: mjmrvica@mrvica.com

## ABSTRACTING AND INDEXING

Abstracting and indexing information for *Paleobiology* is available at: https://www.cambridge.org/core/journals/paleobiology/information/abstracting-and-indexing

### 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: *Paleobiology*, Cambridge University Press, Journals Fulfillment Department, One Liberty Plaza, 20th floor, New York, NY 10006. Send address changes elsewhere to *Paleobiology*, Cambridge University Press, Journals Fulfillment Department, UPH, Shaftesbury Road, Cambridge CB2 8BS, England.

Copyright © 2017 The Paleontological Society. All rights reserved.

Printed in the United States of America