

JOURNAL of PALEONTOLOGY



VOL 95 | NO 3 | MAY 2021



CAMBRIDGE
UNIVERSITY PRESS



OFFICERS AND EDITORS OF THE PALEONTOLOGICAL SOCIETY



<p><i>President</i> WILLIAM DiMICHELE, Smithsonian Institution president@paleosoc.org</p> <p><i>President-Elect</i> ANNE RAYMOND, Texas A&M presidentelect@paleosoc.org</p> <p><i>Past President</i> BRUCE MacFADDEN, Florida Museum of Natural History pastpresident@paleosoc.org</p> <p><i>Secretary</i> CLAUDIA JOHNSON, Indiana Univ. secretary@paleosoc.org</p> <p><i>Treasurer</i> JONATHAN R. HENDRICKS, Paleontological Research Institution treasurer@paleosoc.org</p> <p><i>JP Editor-in-Chief</i> BRENDA R. HUNDA, Cincinnati Museum Center BHunda@cincymuseum.org</p> <p><i>JP Co-Editors</i> JISUO JIN, Univ. of Western Ontario jjin@uwo.ca</p> <p>HANS-DIETER SUES, Smithsonian Institution suesh@si.edu</p> <p>ELLEN CURRANO, Univ. of Wyoming ecurrano@uwyo.edu</p> <p><i>JP Associate Editors</i> BJORN BERNING, Upper Austrian State Museum</p> <p>JOSEPH BOTTING, Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences</p> <p>CHENYANG CAI, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences</p> <p>TOM CRONIN, U.S. Geological Survey</p> <p>WILLIAM A. DiMICHELE, Smithsonian Institution</p> <p>JAN OVE EBBESTAD Museum of Evolution, Uppsala Univ.</p> <p>ROBERT J. ELIAS, Univ. of Manitoba</p> <p>NADIA FRÖBISCH, Museum für Naturkunde</p> <p>PETER J. HARRIES, North Carolina State</p>	<p>MICHAEL HAUTMANN, Univ. of Zurich</p> <p>MARTIN J. HEAD, Brock Univ.</p> <p>THOMAS HEGNA, SUNY Fredonia</p> <p>SAMANTHA HOPKINS, Univ. of Oregon</p> <p>BRIAN HUBER, Smithsonian Institution</p> <p>NIGEL HUGHES, Univ. of California</p> <p>NATHAN JUD, Univ. of Florida</p> <p>MICHAEL KAMINSKI King Fahd University of Petroleum and Minerals</p> <p>DANIEL KSEPKA, Bruce Museum</p> <p>MARCUS KEY, Dickinson College</p> <p>JAMES LAMSDALL, West Virginia Univ.</p> <p>MAX LANGER, Universidade de São Paulo</p> <p>BERTRAND LEFEBVRE, Lyon Univ.</p> <p>STEPHEN A. LESLIE, James Madison Univ.</p> <p>BRUCE LIEBERMAN, Univ. of Kansas</p> <p>ALEX LIU, Univ. of Cambridge</p> <p>STEVEN LoDUCA, Eastern Michigan Univ.</p> <p>RICK LUPIA, Univ. of Oklahoma</p> <p>GABRIELA MÁNGANO, Univ. of Saskatchewan</p> <p>GREG McDONALD, Bureau of Land Management</p> <p>RICHARD MOOI, California Academy of Sciences</p> <p>ALISON MURRAY, Univ. of Alberta</p> <p>GALINA NESTELL, Univ. of Texas at Arlington</p> <p>PAULA NOBLE, Univ. of Nevada</p> <p>ANDRZEJ PISERA, Polish Academy of Sciences</p>	<p>BRIAN PRATT, Univ. of Saskatchewan</p> <p>SIMON SCHNEIDER, CASP</p> <p>CRAIG SCOTT, Royal Tyrrell Museum of Paleontology</p> <p>MARY SILCOX, Univ. of Toronto Scarborough</p> <p>COLIN SPROAT, Univ. of Saskatchewan</p> <p>PAUL TAYLOR, Natural History Museum London</p> <p>DAVID VARRICCHIO, Montana State Univ.</p> <p>STEVE WESTROP, Oklahoma Museum</p> <p>DAVID M. WORK, Maine State Museum</p> <p>MARGARET M. YACOBUCCI, Bowling Green State Univ.</p> <p>SAMUEL ZAMORA, Geological Survey of Spain</p> <p>RENBIN ZHAN, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences</p> <p>SHUNXIN ZHANG, Canada-Nunavut Geoscience Office</p> <p>ZHIFEI ZHANG, Northwest Univ.</p> <p><i>Paleobiology Editor-in-Chief</i> MARK PATZKOWSKY, Penn State Univ.</p> <p><i>Paleobiology Co-Editors</i> NADIA FRÖBISCH, Museum für Naturkunde</p> <p>KEVIN BOYCE, Stanford Univ.</p> <p>WOLFGANG KIESSLING, Universitat Erlangen</p> <p>JAMES CRAMPTON, GNA Science</p> <p><i>Managing Editor</i> JESSICA KASTIGAR, JournalofPaleontology@cambridge.org Paleobiology@cambridge.org</p> <p><i>Communications Officer</i> TAORMINA LEPORE, Univ. of California, Berkeley tlepore@berkeley.edu</p> <p><i>Program Coordinator</i> MATTHEW CLAPHAM, Univ. of California, Santa Cruz mclapham@ucsc.edu</p>	<p><i>Editor, Special Publications</i> COLIN SUMRALL, Univ. of Tennessee, Knoxville csumrall@utk.edu</p> <p><i>Education/Outreach Coordinator</i> ROWAN LOCKWOOD, College of William & Mary rxlock@wm.edu</p> <p><i>Diversity and Inclusion Coordinator</i> DENA SMITH, Univ. of Colorado dena.smith@colorado.edu</p> <p><i>Amateur/Avocational Liaison</i> LINDA McCALL, NC Fossil Club Past-President lndmccall02@yahoo.com</p> <p><i>Representatives At Large</i> DANITA BRANDT, Michigan State Univ. brandt@msu.edu</p> <p>PHOEBE COHEN, Williams College pac3@williams.edu</p> <p><i>Student Representatives</i> ANNAKA CLEMENT, North Dakota State Univ. annaka.clement@ndsu.edu</p> <p>JEANETTE PIRLO, Univ. of Florida jpirlo@flmnh.ufl.edu</p> <p><i>Section Chairs</i> Cordilleran: CARLIE PIETSCH, San Jose State Univ. carlie.pietsch@sjsu.edu</p> <p>North Central: CARRIE SCHWEITZER, Kent State Univ. cschweit@kent.edu</p> <p>Northeastern: JACALYN WITTMER MALINOWSKI, SUNY Geneseo malinowski@geneseo.edu</p> <p>Rocky Mountain: BROOKE LONG-FOX, S. Dakota School of Mines & Tech. brooke.long@mines.sdsmt.edu</p> <p>South Central: VICTORIA CHRAIBI, Tarleton State Univ. chraibi@tarleton.edu</p> <p>Southeastern: TOM TOBIN, Univ. of Alabama ttobin@ua.edu</p>
--	---	--	--

Cover illustration: *Spiracarneylella florencei* n. gen. n. sp. from the Upper Ordovician Point Pleasant Formation, Kentucky and Indiana. Sumrall and Phelps, Fig. 1.9.

ISSN 0022-3360

Copyright © 2021 The Paleontological Society. All rights reserved.

<https://doi.org/10.1017/jpa.2021.32> Published online by Cambridge University Press

SUBSCRIPTION INFORMATION

The Journal of Paleontology [ISSN 0022-3360] is published bimonthly (January, March, May, July, September, and November) by Cambridge University Press (One Liberty Plaza, 20th Floor, New York, NY 10006) 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 <https://www.cambridge.org/core/journals/journal-of-paleontology>.

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/journal-of-paleontology>.

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 the *Journal of Paleontology* is available at: <https://www.cambridge.org/core/journals/journal-of-paleontology/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: *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 © 2021 The Paleontological Society. All rights reserved.

Printed in the United States of America