ISSN 0033-5894 Volume 90, Issue 1, July 2018

QR QUATERNARY RESEARCH

EDITORS Derek B. Booth

Nicholas Lancaster Lewis A. Owen

Published online by Cambridge University Press

CAMBRIDGE UNIVERSITY PRESS

QUATERNARY RESEARCH

SENIOR EDITORS

Derek B. Booth Nicholas Lancaster Lewis A. Owen

ASSOCIATE EDITORS

Patrick J. Bartlein, Robert Booth, Louisa Bradtmiller, Aaron Diefendorf, John Dodson, Tyler Faith, Jaime Fucugauchi, Vance T. Holiday, Kathleen Johnson, Terri Lacourse, Pete Langdon, Thomas Lowell, Curtis W. Marean, Barbara Mauz, James O'Connor, W. Wyatt Oswald, Jeff Pigati, James Shulmeister, Ashok K. Singhvi, Xiaoping Yang

EDITORS EMERITI

A. Lincoln Washburn Estella B. Leopold Stephen C. Porter Eric J. Steig Alan R. Gillespie

MANAGING EDITOR Karin Perring

Quaternary Research Center Box 351360 University of Washington Seattle, WA 98195-1360

EDITORIAL BOARD

ZHISHENG AN

Institute of Earth Environment, Chinese Academy of Sciences *Quaternary geology, monsoon and global change, dust and aerosols*

GAIL ASHLEY Rutgers University Paleoenvironments, paleohydrology of springs, wetlands and rivers, geoarchaeology

JULIE BRIGHAM-GRETTE University of Massachusetts Stratigraphy, sedimentology, chronology of Arctic climate and sea level

JOHN DODSON Institute of Earth Environments, Xi'an, China Australia, Pacific Islands, China, vegetation history, human impacts

YEHOUDA ENZEL Hebrew University of Jerusalem Desert geomorphology, palaeohydrology of lakes and streams

DAVID FINK Australian Nuclear Science and Technology Organisation Cosmogenic dating

SHERI FRITZ

University of Nebraska–Lincoln Paleoclimate, paleolimnology, diatom ecology of North and South America ALAN R. GILLESPIE University of Washington Glacial geology, paleoclimate, megaflooods, Central Asia

LISA GRAUMLICH

University of Washington paleoclimatology, paleoecology, climate change, mountain ecosystems

DONALD K. GRAYSON

University of Washington Archeology and vertebrate paleontology: North America and Western Europe

RICHARD G. KLEIN Stanford University Human origins, Quaternary paleontology

MELANIE LENG British Geological Survey, University of Nottingham Stable isotope geochemistry, climate and environmental change

DANIEL R. MUHS U.S. Geological Survey Quaternary sea level history, Eolian stratigraphy, soils North America, Pacific, Atlantic, and Caribbean Islands COLIN V. MURRAY-WALLACE University of Wollongong Coastal evolution, neotectonism, geochronology, Quaternary sea-level changes

JAY QUADE Department of Geosciences, University of Arizona geochemistry, paleoclimatology, Quaternary geology

MARIA SOCORRO LOZANO-GARCIA

Universidad Nacional Autónoma de México Tropical paleoecology, paleoclimatology, human impact on ecosystems

CATHY L. WHITLOCK Montana State University Paleoecology and vegetation history: North and South America

YURENA YANES University of Cincinnati Isotope geochemistry, paleoclimatology, Quaternary mollusks, taphonomy, paleoecology

LIPING ZHOU Peking University Land-sea correlation, loess, geochronology, geomorphology, Central Asia, East Asia

Cover photo. The cave of Kanaan (Lebanon), 162 m long, was discovered in 1997 in a quarry site. It hosts a large panel of calcite formations, from cave pearls and helicities to thick flowstone and giant stalagmites of several meters height. The calcite formations date to late MIS 7, overlying a clay deposit 4 m thick. Kanaan cave (ca. 90 m asl) is a relict phreatic cave, formed by water draining to the Antelias River when the water table was at or above 90 m asl, much higher than the present water table (ca. 15 m asl). Photo: Georges El-Haibe, Association Libanaise d'Etudes Speleologiques - ALES (See the article by Nehme et al., pages 10-25, in this issue.)