

TM
E43

Elements

An International Magazine of Mineralogy, Geochemistry, and Petrology

August 2014
Volume 10, Number 4

ISSN 1811-5209

Unconventional Hydrocarbons

DAVID R. COLE and MICHAEL A. ARTHUR, Guest Editors

Prospects and Problems

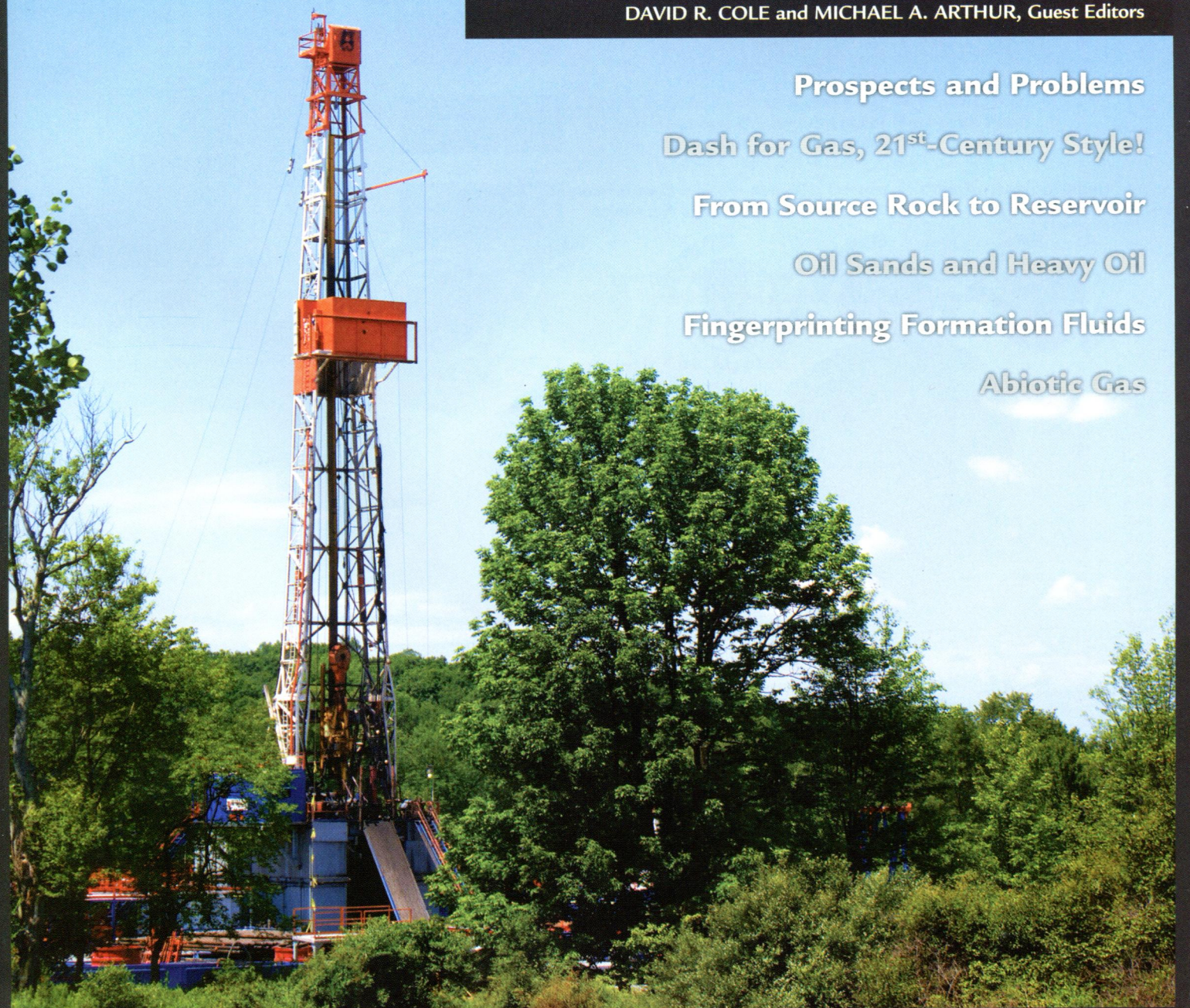
Dash for Gas, 21st-Century Style!

From Source Rock to Reservoir

Oil Sands and Heavy Oil

Fingerprinting Formation Fluids

Abiotic Gas



Elements

An International Magazine of Mineralogy, Geochemistry, and Petrology



Volume 10, Number 4 • August 2014

ABOUT THE COVER:

Drilling the Devonian Marcellus Shale for natural gas in Pennsylvania, USA. If industry best-practices are followed, gas-shale exploration, drilling, and exploitation can occur in both rural and urban settings with minimal impact on the environment. PHOTO © ANDREWMTS | DREAMSTIME.COM

Elements is published jointly by the Mineralogical Society of America, the Mineralogical Society of Great Britain and Ireland, the Mineralogical Association of Canada, the Geochemical Society, The Clay Minerals Society, the European Association of Geochemistry, the International Association of GeoChemistry, the Société Française de Minéralogie et de Cristallographie, the Association of Applied Geochemists, the Deutsche Mineralogische Gesellschaft, the Società Italiana di Mineralogia e Petrologia, the International Association of Geoanalysts, the Polskie Towarzystwo Mineralogiczne (Mineralogical Society of Poland), the Sociedad Española de Mineralogía, the Swiss Society of Mineralogy and Petrology, the Meteoritical Society, and the Japan Association of Mineralogical Sciences. It is provided as a benefit to members of these societies.

Elements is published six times a year. Individuals are encouraged to join any one of the participating societies to receive *Elements*. Institutional subscribers to any of the following journals—*American Mineralogist*, *Clay Minerals*, *Clays and Clay Minerals*, *Mineralogical Magazine*, and *The Canadian Mineralogist*—also receive one copy of *Elements* as part of their 2014 subscription. Institutional subscriptions are available for US\$160 (US\$175 non-US addresses) a year in 2014. Contact the executive editor (tremlbpi@ete.inrs.ca) for information.

Copyright 2014 by the Mineralogical Society of America

All rights reserved. Reproduction in any form, including translation to other languages, or by any means—graphic, electronic, or mechanical, including photocopying or information storage and retrieval systems—without written permission from the copyright holder is strictly prohibited.

Publications mail agreement no. 40037944

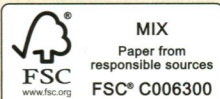
Printed in USA

ISSN 1811-5209 (print)
ISSN 1811-5217 (online)

www.elementsmagazine.org

www.elements.geoscienceworld.org

GeoScienceWorld
Participating Publisher



Федеральное государственное бюджетное учреждение науки
Центральная научная библиотека
Уральского отделения
Российской академии наук (ЦНБ УрО РАН)

Unconventional Hydrocarbons

Guest Editors: **David R. Cole** and **Michael A. Arthur**



Unconventional Hydrocarbon Resources: Prospects and Problems

Michael A. Arthur and David R. Cole



Dash for Gas, 21st-Century Style!

Seth Blumsack



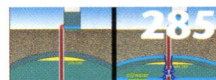
From Source Rock to Reservoir: The Evolution of Self-Sourced Unconventional Resource Plays

L. Taras Bryndzia and Neil R. Braunsdorf



Oil Sands and Heavy Oil: Origin and Exploitation

Stephen R. Larter and Ian M. Head



Fingerprinting "Stray" Formation Fluids Associated with Hydrocarbon Exploration and Production

Benjamin J. Rostron and Serguey Arkadakski



Abiotic Gas: Atypical, But Not Rare

Giuseppe Etiope and Martin Schoell

DEPARTMENTS

Editorial – Natural Gas in the Emerging Global Energy Landscape	243
From the Editors – Editorial Meeting	244
Triple Point – Of Politics, Science and Learned Societies	246
People in the News – Gatta, Dumon, Martin, Malla, Dingwell	248
Perspective – Geoscientists Must Get Involved	250
Perspective – Sustainable Shale Gas Development	251
Meet the Authors	254
Society News	
Mineralogical Association of Canada	298
Mineralogical Society of America	300
Meteoritical Society	302
Sociedad Española de Mineralogía	303
Société Française de Minéralogie et de Cristallographie	303
The Clay Minerals Society	304
European Association of Geochemistry	305
Geochemical Society	306
Association of Applied Geochemists	308
Japan Association of Mineralogical Sciences	309
Mineralogical Society of Great Britain and Ireland	310
Deutsche Mineralogische Gesellschaft	311
International Association of GeoChemistry	312
Meeting Report – Goldschmidt 2014	313
Book Reviews – <i>Oceans and Human Health; Geology of Gem Deposits; Geochemistry of Geologic CO₂ Sequestration</i>	314
Calendar	316
Parting Shots – Hot Oil	317
Advertisers in This Issue	320
