VOLUME 22 ISSUE 2

MAY 2014

ISSN: 0967-1994

# **ZYGOTE** The Biology of Gametes and Early Embryos



Zygote

The Biology of Gametes and Early Embryos

# Editor-in-Chief Brian Dale

Centre for Reproductive Biology Clinica Villa del Sole Via Manzoni 15 Naples 80123 Italy zygote@cambridge.org

John Aitken University of Newcastle, Australia David Albertini KU Cancer Center, Kansas, USA **Colin Brownlee** The Marine Biological Association, UK Andrew Cameron California Institute of Technology, USA Jacques Cohen Tyho-Galileo Research Laboratories ÚSA, USA Alberto Darszon Universidad Nacional Autonoma, Mexico Louis DeFelice Virginia Commonwealth University, Richmond, USA

David Epel Stanford University, USA John Eppig The Jackson Laboratory, Bar Harbour, USA **Rafael Fissore** Amherst College, , USA Antony Galione University of Oxford, UK Alan Handvside University of Leeds, UK Motonori Hóshi Keio University, Japan Yasuhiro Iwao Yamaguchi University, Japan William Jeffery Pennsylvania State University, USA Martin Johnson University of Cambridge, UK

### Subscriptions

Zygote (ISSN 0967-1994) is published quarterly in February, May, August and November. The subscription price (excluding VAT) of Volume 22, 2014, which includes electronic-only access available to institutional subscribers is £416 net (US \$756 in USA, Canada and Mexico); single parts cost £114.40 net (US \$207.90 in USA, Canada and Mexico). Prices include delivery by air where appropriate. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide registration number. their VAT Four parts form a volume. Orders, which must be accompanied by payment, may be sent to any bookseller, subscription agent or to the publisher. Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 8RU, UK, or in the USA, Canada and Mexico to Cambridge University Press, Journals Fulfillment Department, 100 Brook Hill Drive, West Nyack, New York 10994-2133. Japanese prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan. Application to mail at periodicals postage rates pending at New York, NY, and additional mailing offices. POSTMASTER: send address changes in USA, Canada and Mexico to Zygote, Cambridge University Press, 100 Brook Hill Drive, West Nyack, New York 10994-2133.

Advertising Apply to the publisher. Address enquiries to: Advertising Sales Executive (UK) or the Advertising Co-ordinator (North America).

# North American Editor

#### Jonathan van Blerkom

Department of Molecular, Cellular and Developmental Biology, University of Colorado, Boulder, CO 80309, USA

#### Editorial Board

Ken Kitajima Nagoya Úniversity, Japan **Gregory Kopf** KUMC Research Institute, USA Howard Lipshitz Department of Molecular Genetics, Toronto, Canada Steven L'Hernault Emory University, USA Yoshi Masui University of Toronto, Canada David McClay Duke University, USA Yves Menezo UNILABS, Paris, France Hitoshi Sawada Nagoya University, Sugashima, Japan **Richard Schultz** University of Pennsylvania, USA

# Asian Pacific Editor

#### Kazuo Inaba

Shimoda Marine Research Center University of Tsukuba 5-10-1 Shimoda Shizuoka 415-0025 Japan

> B. D. Shur University of Colorado, Denver, ÚSA Andrew Singson Waksman Institute, Piscataway, USA Takavuki Takahashi Hokkaido University, Japan Andrzej K. Tarkowski University of Warsaw, POLAND Victor D. Vacquier SIO, La Jolla, USA Paul Wassarman Roche Institute of Molecular Biology, Nutley, USA Michael Whitaker Institute for Cell and Molecular Biosciences, Newcastle, UK Don Wolf Oregon Health and Science University, USA

#### Copying

This journal is registered with the Copyright Clearance Centre, 222 Rosewood Drive, Danvers, MA 01923, USA. Organisations in the USA who are also registered with the C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of \$16.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0967–1994/2014 \$16.00. Organisations authorised by the Copyright Licensing Agency may also copy material subject to the usual conditions. *ISI Tear Sheet Service*, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA is authorised to supply single copies of separate articles for private use only. *For all other use*, permission should be sought from the Cambridge or the American Branch of Cambridge University Press.

*Internet Access* This journal is included in the Cambridge Journals Online service which can be found at http://journals.cambridge.org. For further information on other Press titles access http://www. cambridge.org.

*Zygote* is covered by the major abstracting and indexing services including Current Contents/Life Sciences, Chemical Abstracts and Index Medicus.

*Claims* for missing issues should be made immediately on receipt of the subsequent issue.

Cover illustration: Left: Human vitrified blastocyst stained 24h post thaw (on day 6) (DNA is blue, microtubules are red)/Katerina Chatzimeletiou. Centre top: Human blastocyst subjected to cryoprotectants (DMSO/EG) but not submerged in liquid nitrogen stained 4h later (on day 5) (DNA is red, microtubules are green)/Katerina Chatzimeletiou. Centre middle: Human vitrified blastocyst stained 24h post thaw (on day 6) (DNA is blue, microtubules are green, and spindles, poles and mid-bodies are red)/Katerina Chatzimeletiou. Centre bottom: Human vitrified blastocyst stained 24h post thaw (on day 6) (DNA is blue, microtubules are green, and spindles, poles and mid-bodies are red)/Katerina Chatzimeletiou. Right: Mitotic apparatus of a telophase sea urchin (*Strongylocentrotus pupuratus*) embryo (DNA is blue, tubulin is red, actin is green)/Amro Hamdoun.

© CAMBRIDGE UNIVERSITY PRESS 2014