

# Applied Mathematics

*European Journal of*

VOLUME 21 · PART 6 · DECEMBER 2010

*Incorporating  
Surveys in Industrial and  
Applied Mathematics*

**CAMBRIDGE**  
UNIVERSITY PRESS

*European Journal of Applied Mathematics*

VOL 21 · PART 6 · DECEMBER 2010 · PAGES 479–590

**CAMBRIDGE**

**CO-EDITORS-IN-CHIEF****Professor S. D. Howison**

*Mathematical Institute, 24-29 St Giles, Oxford OX1 3LB, UK*  
 ejam@maths.ox.ac.uk

**Professor A. A. Lacey**

*Department of Mathematics, Heriot-Watt University, Riccarton, Edinburgh EH14 4AS, UK.* a.a.lacey@ma.hw.ac.uk

**Professor M. J. Ward**

*Department of Mathematics, 121-1984 Mathematics Road, University of British Columbia, Vancouver BC, Canada V6T 1Z2*  
 ward@math.ubc.ca

**ASSOCIATE EDITORS**

**Professor N. Balmforth**, *Department of Mathematics, Building 229C, University of British Columbia, Vancouver BC, Canada V6T 1Z2, njb@math.ubc.ca*

**Professor Paul Bressloff**, *University of Utah, email: bressloff@math.utah.edu*

**Professor R. Caffisch**, *Department of Mathematics, UCLA, Los Angeles, CA 90024, USA. caffisch@math.ucla.edu*

**Professor Zhiming Chen**, *Institute of Computational Mathematics, Academy of Mathematics & Systems Science, Chinese Academy of Sciences, Beijing, 100080, China. zmchen@lsec.cc.ac.cn*

**Professor P. A. Clarkson**, *Institute of Mathematics & Statistics, University of Kent at Canterbury, Cornwallis Building, Canterbury, Kent CT2 7NT, UK. p.a.clarkson@ukc.ac.uk*

**Dr P. Dellar**, *OCLAM, Mathematical Institute, 24-29 St Giles', Oxford, OX1 3LB, UK. dellar@maths.ox.ac.uk*

**Professor H. Engl**, *Ind math der Univ Linz, Altenberger Street 69, A-4040 Linz, Austria. heinz.engl@jku.at*

**Professor A. Goriely**, *Department of Mathematics, Building #89, University of Arizona, Tucson, AZ 85721, USA. goriely@math.arizona.edu*

**Professor M. Herrero**, *Dept de Matematica Aplicada, Facultad de Matematicas, Universidad Complutense, Cuidad Universitaria s/n, 28040 Madrid, Spain. herrero@mat.ucm.es*

**Professor J. R. King**, *Department of Theoretical Mechanics, University of Nottingham, University Park, Nottingham NG7 2RD, UK. john.king@nottingham.ac.uk*

**Professor G. A. Kriegsmann**, *Department of Mathematical Sciences, Centre for Applied Mathematics & Statistics, New Jersey Institute of Technology, University Heights, Newark, NJ 07102-9895, USA, grkrie@micro.njit.edu*

**Professor Rachel Kuske**, *University of British Columbia, email: rachel@math.ubc.ca*

**Professor Peter A. Markowich**, *DAMTP, Wilberforce Road, Cambridge CB3 0WA, UK, P.A.Markowich@damtp.cam.ac.uk*

**Professor Robert M. Mattheij**, *Department of Mathematics & Computer Science, TU Eindhoven, PO Box 513, NL-5600 MB Eindhoven, The Netherlands. mattheij@win.tue.nl*

**Professor Joyce McLaughlin**, *Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy NY 12180, USA mclauj@rpi.edu*

**Professor Y. Nishiura**, *Laboratory of Nonlinear Studies & Computation, Research Institute for Electronic Science, Hokkaido University, N12 W6 Sapporo 060-0812, Japan. nishiura@aurora.es.hokudai.ac.jp*

**Dr J. R. Ockendon**, *Mathematical Institute, University of Oxford, 24-29 St Giles, Oxford OX1 3LB, UK ock@maths.ox.ac.uk*

**Professor Mark Peletier**, *Technical University of Eindhoven, email: m.a.peletier@tue.nl*

**Professor M. Primicerio**, *Dipartimento di Matematica, "U.Dini" Viale Morgagni 67/a, 50134 Firenze, Italy. mario.primicerio@math.unifi.it*

**Professor M. Pugh**, *Department of Mathematics, University of Toronto, 40 St George Street, Room 6290, Toronto, Ontario Canada M5S 2E4, mpugh@math.toronto.edu*

**Professor V. V. Pukhnachov**, *Lavrentyev Institute of Hydrodynamics, Siberian Division of the Russian Academy of Sciences, Novosibirsk 630090, Russia. pukh@hydro.nsc.ru*

**Professor J. Rubinstein**, *Department of Mathematics, Technion, Haifa 32000, Israel. koby@math.technion.ac.il*

**Professor F. Santosa**, *School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church St SE, Minneapolis, MN 55455, USA. santosa@math.umn.edu*

**Professor T. P. Witelski**, *Mathematical Institute, University of Oxford, 24-29 St Giles, Oxford OX1 3LB.*

witelski@maths.ox.ac.uk

© CAMBRIDGE UNIVERSITY PRESS 2010

**SUBSCRIPTIONS**

*European Journal of Applied Mathematics* (ISSN 0956-7925) is published bimonthly in February, April, June, August, October and December. The 2010 subscription price (excluding VAT) of a volume, which includes print and electronic access, is £445 (US \$840 in USA, Canada and Mexico); The electronic-only price available to institutional subscribers is £399 (US \$750 in USA, Canada and Mexico). Single parts are £80 net (US \$150 in USA, Canada and Mexico) plus postage. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered members should provide their VAT registration number. Japanese prices for institutions (including ASP delivery) are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan.

POSTMASTER : send address changes in USA, Canada and Mexico to *European Journal of Applied Mathematics*, Cambridge University Press, 100 Brook Hill Drive, West Nyack, New York 10994-2133.

Claims for missing issues should be made immediately on receipt of the subsequent issue. Copies of back numbers are available from Cambridge University Press.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information.

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE

The Pitt Building, Trumpington Street, Cambridge CB2 1RP, United Kingdom

CAMBRIDGE UNIVERSITY PRESS

The Edinburgh Building, Cambridge CB2 8RU, United Kingdom

32 Avenue of the Americas, New York, NY 10013-2473, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

Ruiz de Alarcón 13, 28014, Madrid, Spain

Dock House, The Waterfront, Cape Town 8001, South Africa