

# Discontinuity, Nonlinearity and Complexity

## Editors

### Valentin Afraimovich

San Luis Potosi University, IICO-UASLP, Av.Karakorum 1470 Lomas  
4a Seccion, San Luis Potosi, SLP 78210, Mexico  
Fax: +52 444 825 0198  
Email: valentin@cactus.iico.uaslp.mx

### Lev Ostrovsky

Zel Technology/NOAA ETL, Boulder CO 80305, USA  
Fax: +1 303 497 7384  
Email: Lev.A.Ostrovsky@noaa.gov

### Xavier Leoncini

Centre de Physique Théorique, Aix-Marseille Université, CPT  
Campus de Luminy, Case 907  
13288 Marseille Cedex 9, France  
Fax: +33 4 91 26 95 53  
Email: leoncini@cpt.univ-mrs.fr

### Dimitry Volchenkov

The Center of Excellence Cognitive Interaction Technology  
Universität Bielefeld, Mathematische Physik Universitätsstraße 25 D-  
33615 Bielefeld, Germany  
Fax: +49 521 106 6455  
Email: volchenk@physik.uni-bielefeld.de

## Associated Editors

### Marat Akhmet

Department of Mathematics  
Middle East Technical University  
06531 Ankara, Turkey  
Fax: +90 312 210 2972  
Email: marat@metu.edu.tr

### Nikolai A. Kudryashov

Department of Applied Mathematics Moscow  
Engineering and Physics Institute (State  
University), 31 Kashirskoe Shosse 115409  
Moscow, Russia  
Fax: +7 495 324 11 81  
Email: kudryashov@mephi.ru

### Jose Antonio Tenreiro Machado

ISEP-Institute of Engineering of Porto  
Dept. of Electrotechnical Engineering  
Rua Dr. Antonio Bernardino de Almeida  
4200-072 Porto, Portugal  
Fax: +351 22 8321159  
Email: jtm@dee.isep.ipp.pt

### Dumitru Baleanu

Department of Mathematics and Computer  
Sciences  
Cankaya University, Balgat  
06530 Ankara, Turkey  
Email: dumitru@cankaya.edu.tr

### Gennady A. Leonov

Department of Mathematics and Mechanics  
St-Petersburg State University  
198504, Russia  
Email: leonov@math.spbu.ru

### Josep J. Masdemont

Department of Matematica Aplicada I  
Universitat Politecnica de Catalunya (UPC)  
Diagonal 647 ETSEIB  
08028 Barcelona, Spain  
Email: josep@barquins.upc.edu

### Marian Gidea

Department of Mathematics  
Northeastern Illinois University  
Chicago, IL 60625, USA  
Fax: +1 773 442 5770  
Email: mgidea@neiu.edu

### Albert C.J. Luo

Department of Mechanical and Industrial  
Engineering, Southern Illinois University  
Edwardsville, IL 62026-1805, USA  
Fax: +1 618 650 2555  
Email: aluo@siue.edu

### Miguel A.F. Sanjuan

Department of Physics  
Universidad Rey Juan Carlos  
Tulipán s/n, 28933 Mostoles Madrid, Spain  
Fax: +34 91 664 74 55  
Email: miguel.sanjuan@urjc.es

### Ranis N. Ibragimov

Department of Mathematics  
University of Texas at Brownsville  
TX 78520, USA  
Fax: +1 956 882 6637  
Email: ranis.ibragimov@utb.edu

### E.N. Macau

Lab. Associado de Computação e Matemática  
Aplicada, Instituto Nacional de Pesquisas  
Espaciais, Av. dos Astronautas, 1758 12227-  
010 São José dos Campos –SP Brazil  
Email: elbert@lac.inpe.br

## International Advisory Editors Board

### Ravi P. Agarwal

Department of Mathematics, Texas A&M  
University – Kingsville, Kingsville  
TX 78363-8202, USA  
Email: agarwal@tamuk.edu

### Didier Bénisti

CEA, DAM, DIF 91297 Arpajon Cedex  
France  
Fax: +33 169 267 106  
Email: didier.benisti@cea.fr

### Maurice Courbage

CNRS-UMR 7057 "Matière et Systèmes  
Complexes", 75205 Paris Cedex 13 France  
Email: maurice.courbage@univ-paris-  
diderot.fr

*Continued on back materials*

*An Interdisciplinary Journal of*  
**Discontinuity,  
Nonlinearity,  
and Complexity**

Volume 1, Issue 2, June 2012

Editors  
Valentin Afraimovich  
Xavier Leoncini  
Lev Ostrovsky  
Dimitry Volchenkov



L&H Scientific Publishing, LLC, USA

## **Publication Information**

*Discontinuity, Nonlinearity and Complexity* (ISSN 2164-6376 (print), eISSN 2164-6414 (online)) is published quarterly (March, June, September, and December) by L & H Scientific Publishing, LLC, P.O. Box 99, Glen Carbon, IL62034, USA. Subscription prices are available upon request from the publisher or from this journal website. Subscriptions are accepted on a prepaid basis only and entered on a calendar year basis. Issues are sent by standard mail (Surface in North America, air delivery outside North America). Priority rates are available upon request. Claims for missing issues should be made within six months of the date of dispatch.

## **Changes of Address**

Send address changes to L&H Scientific Publishing, LLC, P.O. Box 99, Glen Carbon, IL62034, USA. Changes of address must be received at L&H Scientific Publishing eight weeks before they are effective.

## **Authors Inquiries**

For inquiries relative to the submission including electronic submission where available, please visit journal website or contact journal Editors-in-Chief.

## **Advertising Information**

If you are interested in advertng or other commercial opportunities, please email via [lhscientificpublishing@gmail.com](mailto:lhscientificpublishing@gmail.com) and your enquiry will be handled as soon as possible.

## **© 2012 L&H Scientific Publishing, LLC. All rights reserved**

L&H Scientific Publishing, LLC requires the authors to sign a Journal Copyright Transfer Agreement for all articles published in L&H Scientific. The Copyright Transfer Agreement is an agreement under which the author retains copyright in the work but grants L& H Scientific Publishing LLC the sole and exclusive right and license to publish the full legal term of copyright.

Authors are responsible for obtaining permission from copyright holders for reproducing any illustrations, tables, figures or lengthy quotations published somewhere previously.

For authorization to photocopy materials for internal or personal use under those circumstances not falling within the fair use provisions of Copyright Act, requests for reprints and translations should be addressed to the permission office of L&H Scientific publishing, LLC via [lhscientificpublishing@gmail.com](mailto:lhscientificpublishing@gmail.com) or call: 1-618-402-2267. Permission of the Publisher and payment of a fee are required for all other photocopying, including multiple or systematic copying, copying for advertising or promotional purposes, resale, and forms of document delivery. Special rates are available for educational institutions to make photocopies for non-profit educational classroom use.

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the publisher is required for resale or distribution outside the institution.

Permission of the Publisher is required to store or use electronically any materials contained in this journal, including any entire or partial article, please contact the publisher for advice. Otherwise, no part of this publication can be reproduced, stored in a retrieval systems or transmitted in any form or by means, electronic, mechanical, photocopying, recording or without prior written permission of the Publisher.

## **Disclaimer**

The authors, editors and publisher will not accept any legal responsibility for any errors or omissions that may be made in this publication. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed in USA on acid-free paper.



# **ORDER FORM**

Please complete the order form below and send it to our office below.  
L&H Scientific Publishing, P.O. Box 99, Glen Carbon, IL 62034, USA  
1-618-402-2267 (Phone) 1-618-545-9338 (Fax)  
Email: [lhscientificpublishing@gmail.com](mailto:lhscientificpublishing@gmail.com)

Title Selection				
No	TITLE	ISSN	QTY	PRICE(US\$)
1				
2				
3				
4				

## Methods Of Payment

Please Make Check/Bank Draft Payable to: L&H Scientific Publishing

Methods of Payment  Check/Bank Draft Enclosed \_\_\_\_\_ US\$  MasterCard  Visa

Card No               Exp. Date

## Contact Information

Organization: \_\_\_\_\_

Name: \_\_\_\_\_

Street Address: \_\_\_\_\_

(sorry, we cannot deliver to P.O. Box) \_\_\_\_\_

City/State/Zip \_\_\_\_\_

Country: \_\_\_\_\_

Email: \_\_\_\_\_

Phone/ Fax: \_\_\_\_\_

Date X	Signature X
--------	-------------

## **Aims and Scope**

The interdisciplinary journal publishes original and new results on recent developments, discoveries and progresses on Discontinuity, Nonlinearity and Complexity in physical and social sciences. The aim of the journal is to stimulate more research interest for exploration of discontinuity, complexity, nonlinearity and chaos in complex systems. The manuscripts in dynamical systems with nonlinearity and chaos are solicited, which includes mathematical theories and methods, physical principles and laws, and computational techniques. The journal provides a place to researchers for the rapid exchange of ideas and techniques in discontinuity, complexity, nonlinearity and chaos in physical and social sciences. Topics of interest include but not limited to

- Complex and hybrid dynamical systems
- Discontinuous dynamical systems (i.e., impulsive, time-delay, flow barriers)
- Nonlinear discrete systems and symbolic dynamics
- Fractional dynamical systems and control
- Stochastic dynamical systems and randomness
- Complexity, self-similarity and synchronization
- Complex nonlinear phenomena in physical systems
- Stability, bifurcation and chaos in complex systems
- Turbulence and other complex phenomena in hydrodynamics
- Nonlinear waves and solitons
- Dynamical networks
- Combinatorial aspects of dynamical systems
- Biological dynamics and biophysics
- Pattern formation, social science and complexization

No length limitations for contributions are set, but only concisely written manuscripts are published. Brief papers are published on the basis of Technical Notes. Discussions of previous published papers are welcome.

## **Peer Review**

*Discontinuity, Nonlinearity and Complexity* adopts the traditional blind-review policy in which the reviewers' names are concealed for submission author(s) for free submission. Each submitted manuscript is reviewed at least two referees in appropriate fields. In addition, the editorial board members' recommendation or established experts' recommendation publication are welcome.

## **Manuscript Submission Guidelines**

For manuscript submission, authors can directly contact Editors-in-Chief. Manuscript preparation can follow the sample papers and journal manuscript templates (word file and Latex files), which can be found from the website at <https://lhscientificpublishing.com/Journals/DNC-Default.aspx>

## **Proofs and Electronic Offprints**

Authors will receive a PDF proof of their articles and, on publication, electronic offprints of the article.

## **Open Access**

After manuscripts were accepted, author(s) have a right to request the accepted manuscripts published by L&H Scientific publishing with open access, and the author(s) have a responsibility to paying the open access publication fee with US\$30 per page. The copyright is still held by the Publisher. Without any request of the open access publication, the accepted manuscripts are assumed to be published traditionally.

*Continued from inside front cover*

**Alexandre N. Carvalho**

Departamento de Matemática, Instituto de Ciências Matemáticas e de Computação  
Universidade de São Paulo - Campus de São Carlos, Caixa Postal 668, 13560-970  
São Carlos SP, Brazil  
Email: andcarva@icmc.usp.br

**Michal Feckan**

Department of Mathematical Analysis and Numerical Mathematics, Comenius University Mlynska dolina  
842 48 Bratislava, Slovakia  
Fax: +421 2 654 12 305  
Email: michal.feckan@fmph.uniba.sk

**Stefano Galatolo**

Dipartimento di Matematica Applicata  
Via Buonattoti 1  
56127 Pisa, Italy  
Email: s.galatolo@ing.unipi.it

**N.H. Ibragimov**

Department of Mathematics, IHN  
Blekinge Institute of Technology  
S-371 79 Karlskrona, Sweden  
Fax: +46 455 385 407  
Email: nail.ibragimov@bth.se

**Tassilo Küpper**

Mathematical Institute  
University of Cologne, Weyertal 86-90  
D-50931 Cologne, Germany  
Fax: +49 221 470 5021  
Email: kuepper@math.uni-koeln.de

**Marc Leonetti**

IRPHE, Aix-Marseille Université  
UMR CNRS 6594, Technopôle de Château-Gombert 13384 Marseilles Cedex 13 France  
Fax: + 33 4 13 55 20 01  
Email: leonetti@irphe.univ-mrs.fr

**Mikhail Malkin**

Department of Mathematics and Mechanics  
Nizhny Novgorod State University, Nizhny Novgorod, Russia  
Fax: +7 831 465 76 01  
Email: malkin@unn.ru

**Vladimir I. Nekorkin**

Institute of Applied Physics of RAS  
46 Ulyanov Street, 603950, Nizhny Novgorod, Russia  
Email: vnekorkin@neuron.appl.sci-nnov.ru

**Dmitry E. Pelinovsky**

Department of Mathematics & Statistics  
McMaster University, 1280 Main Street West, Hamilton, Ontario, Canada L8S 4K1  
Fax: +1 905 522 0935  
Email: dmpeli@math.mcmaster.ca

**Alexander N. Pisarchik**

Centro de Investigaciones en Optica  
A.C. Loma del Bosque #115  
Lomas del Campestre  
37150 Leon Guanajuato, Mexico  
Fax: +52 477 441 4209  
Email: apisarch@cio.mx

**Raul Rechtman**

Centro de Investigacion en Energia  
Universidad Nacional Autonoma de Mexico  
Priv. Xochicalco S/N, Temixco  
Morelos 62580, Mexico  
Fax: +52 555 622 9791  
Email: rrs@cie.unam.mx

**Andrey Shilnikov**

Neuroscience Institute and Department of Mathematics and Statistics  
Georgia State University, 100 Piedmont Ave  
SE Atlanta GA 30303, USA  
Fax: +1 404 413 6403  
Email: ashilnikov@gsu.edu

**Vasily E. Tarasov**

Skobeltsyn Institute of Nuclear Physics  
Moscow State University  
119992 Moscow, Russia  
Fax: +7 495 939 03 97  
Email: tarasov@theory.sinp.msu.ru

**Marco Thiel**

Institute for Mathematical Biology and Complex Systems  
University of Aberdeen  
AB243UE Aberdeen, Scotland, UK  
Fax: +44 1224 273105  
Email: m.thiel@abdn.ac.uk

**Vladimir V. Uchaikin**

Ulyanovsk State University  
L.Tolstoy Str. 42  
Ulyanovsk 432700, Russia  
Fax: +7 842 232 90 14  
Email: uchaikin@sv.uven.ru

**Alexei A. Vasiliev**

Space Research Institute  
Profsoyuznaya 84/32  
Moscow 117997, Russia  
Fax: +7 495 333 12 48  
Email: valex@iki.rssi.ru

**Howard (Howie) Weiss**

Department of Mathematics  
Georgia Institute of Technology Atlanta  
GA 30332, USA  
Fax: +1 509 692 4516  
Email: weiss@math.gatech.edu

**Todd Young**

Department of Mathematics  
Ohio University  
Athens, OH 45701, USA  
Email: young@math.ohiou.edu