

VOLUME 39 PART 9 SEPTEMBER 2019

# *Ergodic theory and dynamical systems*

## MANAGING EDITORS

I. Melbourne, University of Warwick  
R. Sharp, University of Warwick

## EXECUTIVE EDITORS

L. J. Díaz, Pontifícia Universidade Católica do Rio de Janeiro  
A. Gorodnik, University of Zurich  
M. Hochman, Hebrew University of Jerusalem  
B. Kra, Northwestern University  
I. Putnam, University of Victoria  
W. Shen, Fudan University

## SURVEY EDITORS

M. Einsiedler, ETH Zurich  
C. Matheus, École Polytechnique

**CAMBRIDGE**  
UNIVERSITY PRESS

# Ergodic theory and dynamical systems

## MANAGING EDITORS

I. Melbourne R. Sharp  
etds@warwick.ac.uk

## EXECUTIVE EDITORS

L. J. Díaz A. Gorodnik M. Hochman  
B. Kra I. Putnam W. Shen

## SURVEY EDITORS

M. Einsiedler C. Matheus

## EDITORIAL BOARD

A. Avila (Université Paris VI)  
M. Boyle (University of Maryland)  
D. Dolgopyat (University of Maryland)  
H. Furstenberg (Hebrew University of Jerusalem)  
V. Kaloshin (University of Maryland)  
D. Kleinbock (Brandeis University)  
F. Ledrappier (Université Paris VI)  
E. Lindenstrauss (Hebrew University of Jerusalem)  
C. Liverani (University of Rome II)  
S. Mozes (Hebrew University of Jerusalem)  
Ya. B. Pesin (Pennsylvania State University)

M. Rasmussen (Imperial College London)  
D. Ruelle (IHES, Bures-sur-Yvette)  
N. Simányi (University of Alabama, Birmingham)  
S. van Strien (Imperial College London)  
M. Tsujii (Kyushu University)  
A. M. Vershik (Steklov Mathematical Institute, St. Petersburg)  
M. Viana (IMPA, Rio de Janeiro)  
T. Ward (University of Leeds)  
B. Weiss (Hebrew University of Jerusalem)  
A. Wilkinson (University of Chicago)

*Ergodic Theory and Dynamical Systems* provides a focus for this important and rapidly developing area of mathematics and an opportunity to bring together many major contributors in the field which are, at the moment, scattered over a large number of non-specialist periodicals.

Dynamical methods have proved to be a powerful unifying force in mathematics in recent decades, and they are now beginning to be felt in allied subjects such as physics and biology. *Ergodic Theory and Dynamical Systems* acts as a forum for central problems of differential geometry, number theory, operator algebras, topological, differential and symbolic dynamics, and celestial and statistical mechanics.

Expository survey articles and conference proceedings will be included from time to time and reviews of relevant books will also be published.

**Copying:** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, USA ([www.copyright.com](http://www.copyright.com)). Organizations in the USA who are also registered with CCC may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to CCC. This consent does not extend to multiple copying for promotional or commercial purposes.

Organizations authorized by the Copyright Licensing Agency may also copy material subject to the usual conditions. For all other use, permission should be sought from Cambridge or the American branch of Cambridge University Press.

**Internet Access:** This journal can be found on Cambridge Core at [cambridge.org/ets](http://cambridge.org/ets). For further information on other Press titles visit [cambridge.org/journals](http://cambridge.org/journals).

**Subscriptions:** *Ergodic Theory and Dynamical Systems* (ISSN 0143-3857) is published monthly. The subscription price

(excluding VAT) of volume 39, 2019 which includes print and electronic access, is £1706.00 (US\$2963.00 in USA, Canada and Mexico). The electronic-only price available to institutional subscribers is £1456.00 (US\$2556.00 in USA, Canada and Mexico). Single parts cost £246.00 net (US\$422.00 in USA, Canada and Mexico). Prices include delivery by air where appropriate. Members of the London Mathematical Society and American Mathematical Society may subscribe for £373.00 (US\$618.00). Twelve parts form a volume. EU subscribers (outside the UK) who are not registered for VAT should add VAT at their country's rate. VAT registered subscribers should provide their VAT registration number. Orders, which must be accompanied by payment, may be sent to a book-seller, subscription agent or direct to the publishers: Cambridge University Press, Journals Fulfillment Department, University Printing House, Shaftesbury Road, Cambridge CB2 8BS or, in the USA, Canada and Mexico, Cambridge University Press, Journals Fulfillment Department, One Liberty Plaza, Floor 20, New York, NY 10006, USA. Japanese prices for institutions are available from Kinokuniya Company Ltd, P.O. Box 55, Chitose, Tokyo 156, Japan.

Printed in the UK by Bell & Bain Ltd., Glasgow

© Cambridge University Press 2019

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE

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

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, Floor 20, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

C/ Orensé, 4, planta 13, 28020 Madrid, Spain

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