

VOLUME 43 PART 5 MAY 2023

# *Ergodic theory and dynamical systems*

MANAGING EDITORS

B. Kra, Northwestern University  
I. Melbourne, University of Warwick

EXECUTIVE EDITORS

L. J. Díaz, Pontifícia Universidade Católica do Rio de Janeiro  
A. Gorodnik, University of Zurich  
A. Quas, University of Victoria  
W. Shen, Fudan University  
P. Shmerkin, University of British Columbia  
D. Thompson, Ohio State University

SURVEY EDITORS

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



CAMBRIDGE  
UNIVERSITY PRESS

# *Ergodic theory and dynamical systems*

## MANAGING EDITORS

B. Kra I. Melbourne  
etds@warwick.ac.uk

## EXECUTIVE EDITORS

L. J. Díaz A. Gorodnik  
A. Quas W. Shen P. Shmerkin D. Thompson

## 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)  
M. Hochman (Hebrew University of Jerusalem)  
V. Kaloshin (Institute of Science and Technology Austria)  
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)

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

*Ergodic Theory and Dynamical Systems* focuses on a rich variety of research areas which, although diverse, employ a variety of dynamical methods. The journal provides a focus for this important and flourishing area of mathematics and brings together major contributions in the field. The journal acts as a forum for central problems of dynamical systems and of interactions of dynamical systems with numerous other areas, including geometry, geometric group theory, number theory, combinatorics, harmonic analysis, operator algebras, celestial and statistical mechanics, and probability theory.

*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 43, 2023 which includes print

and electronic access, is £2034.00 (US\$3532.00 in USA, Canada and Mexico). The electronic-only price available to institutional subscribers is £1643.00 (US\$2885.00 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 £438.00 (US\$724.00). Twelve parts form a volume. EU subscribers may be required to pay import VAT at their country's rate on receipt of physical deliveries. EU subscribers for electronic deliveries who are not VAT registered should add VAT at their country's rate. VAT registered subscribers should provide their VAT 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, Shaftesbury Road, Cambridge CB2 8EA 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 and bound by CPI Group (UK) Ltd, Croydon, CR0 4YY*

© Cambridge University Press & Assessment 2023

Published by Cambridge University Press

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

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

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,

New Delhi – 110025, India

103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore

238467