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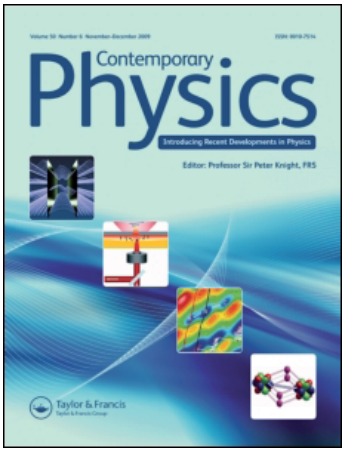

Contemporary Physics
Publication details, including instructions for authors and subscription information:
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Microscopic Chaos, Fractals and Transport in Nonequilibrium Statistical Mechanics, Advanced Series in Nonlinear Dynamics, Vol. 24, by R. Klages

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First published on: 03 March 2010

To cite this Article Sanjuán, Miguel A. F.(2010) 'Microscopic Chaos, Fractals and Transport in Nonequilibrium Statistical Mechanics, Advanced Series in Nonlinear Dynamics, Vol. 24, by R. Klages', Contemporary Physics,, First published on: 03 March 2010 (iFirst)
To link to this Article: DOI: 10.1080/00107510903312957
URL: http://dx.doi.org/10.1080/00107510903312957

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Contemporary Physics
2010, 1, i*First* article

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BOOK REVIEW

Microscopic Chaos, Fractals and Transport in Nonequilibrium Statistical Mechanics, Advanced Series in Nonlinear Dynamics, Vol. 24, by R. Klages, Singapore, World Scientific, 2007, 441 pp., £55.00 (hardback), ISBN 978-981-256-507-5. Scope: monograph. Level: graduate students and researchers.

Much progress has been done in the past few years in the advancement of knowledge in the foundations of nonequilibrium statistical mechanics. This progress has had interesting ingredients coming from the results in kinetic theory, statistical mechanics, dynamical systems theory, stochastic processes and computational physics. Important and key concepts in dynamical systems theory or nonlinear dynamics as is commonly used in the physics literature, such as chaos and fractals have played an important role in the recent studies in nonequilibrium statistical mechanics. This book precisely shows some of the key contributions to the field. It deals with some topics of research carried out by the author in the last decade comprising, on the one hand, the calculation and explanation of fractal transport coefficients in low-dimensional deterministic dynamical systems, and on the other hand, with the construction and analysis of nonequilibrium steady states in dissipative dynamical systems associated with thermal reservoirs. These are the two main parts of the monograph. The monograph also contains a third part, where an outlook to further topics of research in chaotic transport theory are outlined, including an important list of conclusions.

The monograph corresponds to a profound amendment and updated version of the author's habilitation thesis in Germany, in which 10 years of research work in the field is summarised. The bibliography provided in the monograph is very extensive and comprises most of the literature on the field, and thus it constitutes an important point of this book. The level of the exposition is variable, being somehow more technical at the beginning, though the prerequisites are fundamental notions of statistical mechanics, stochastic processes and nonlinear dynamics, including chaotic dynamics and fractals.

The book would be of interest for graduate students and researchers interested in recent progress in the field and those attempting to enter it. Physicists interested in the applications of chaos theory into statistical mechanics can also benefit from its reading.

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ISSN 0010-7514 print/ISSN 1366-5812 online
DOI: 10.1080/00107510903312957
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