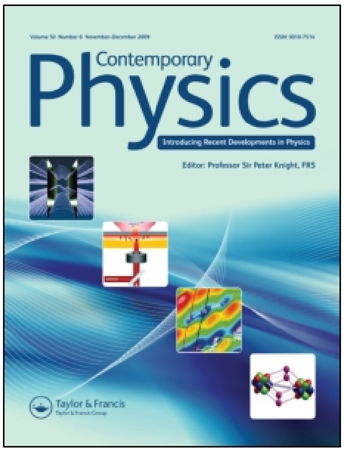

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Dynamical Processes on Complex Networks, by A. Barrat, M. Barthélemy and A. Vespignani

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BOOK REVIEW

Dynamical Processes on Complex Networks, by A. Barrat, M. Barthélemy and A. Vespignani, Cambridge, Cambridge University Press, 2008, 368 pp., £40.00 (hardback), ISBN 9780521879507. Scope: textbook. Level: graduate students in any scientific disciplines.

Since the paper of Watts and Strogatz in 1998, there has been an explosion of interest from physicists in the subject of networks. With a variety of popular science and textbooks already available, does this book add anything new to my library? The answer is definitely yes and the clue is in the first two words of the title.

This is not a book where you will learn everything about networks. The first three chapters have a reasonable introduction to Complex Networks but it is by no means exhaustive. The value of the book is in the central eight chapters, each of which looks at a different type of process. It is the interactions between neighbours which define the evolution of the system and it is a network which defines what we mean by a neighbour. In physics we are used to models of spins interacting on regular lattices and indeed chapter five starts with the basic properties of an Ising model. However, most of the examples considered in this book are cross-disciplinary where the networks are of a much more general kind. For example the chapters on epidemic spreading and on social science processes explore networks of acquaintances while examination of searching strategies looks at the network of web pages.

Each chapter is well balanced. Basic analytical calculations are presented which enables one to get a good feel for the core principles of each topic. Any first year graduate student in a scientific field will be able to follow these, and more complicated approaches are left to the numerous references. These are then followed up with examples from numerical simulations. This focus on breadth rather than depth makes this book easy to read.

The book is written with a theoretical physicist's view of the world. There are few explicit real world examples, none in the chapter on traffic for instance, and it is left to discussion and intuition to suggest why the models used are suitable for the problems suggested. This is also reflected in the domination of physics journals in the references. A non-physicist will get a good view of how physicists tackle these problems, but I don't feel that the authors are comprehensively exploring the approaches taken in other disciplines. For instance, there is no mention of the Moran model of population genetics even though this includes the Voter Model of Chapter 10 as a special case. However, I can forgive such omissions for the reasons set out in the final chapter, which is a nice critique of network science. This chapter notes that this is a field new only to physicists, yet their understandable high hopes and hyperbolae should not blind detractors from the fact that the approach represented by this book can and has made useful contributions.

Overall I feel this is a very useful book that fills an important gap in the market of books on networks. I can easily accept its limitations given that it delivers on what it sets out to do. I will be opening this book whenever I want to start modelling a dynamical process on a network.

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