



# Complex and Adaptive Dynamical Systems: A Primer (Springer: Complexity)

By Claudio Gros

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Discover a wide range of findings in quantitative complex system science that help us make sense of our complex world. Written at an introductory level, the book provides an accessible entry into this fascinating and vitally important subject.

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### Editorial Review

#### Review

From the reviews: "This is a very interesting introductory book written for a broad audience of graduate students in natural sciences and engineering. It can be equally well used both for teaching and self-education. ... very well structured and every topic is illustrated by simple and motivating examples. This is a true guidebook to the world of complex nonlinear phenomena. ... Every chapter is followed by theoretical and computational exercises (with detailed solutions presented at the end of the book) and a list of references for further reading." (Ilya Pavlyukevich, Zentralblatt MATH, Vol. 1146, 2008) "Claudius Gros's Complex and Adaptive Dynamical Systems: A Primer is a welcome addition to the literature. ... A particular strength of the book is its emphasis on analytical techniques for studying complex systems. ... Gros's book is for a fairly advanced and mathematically sophisticated audience ... in the field. ... Complex and Adaptive Dynamical Systems could be a fine option for well-prepared students looking for a focused introduction to complex systems ... ." (David P. Feldman, Physics Today, July, 2009) From the reviews of the second edition: "This is the second edition of a nicely written and generously illustrated text introducing the reader to a wide variety of topics related to dynamics of complex dynamical systems. ... The book can be used both for self-education and as a reading for a course on complex systems; the choice of material is quite flexible due to the reduced dependence among the chapters ... . The text should attract attention of graduate students and scientists working in natural sciences, engineering and neuroscience." (Yuri V. Rogovchenko, Zentralblatt MATH, Vol. 1232, 2012)

#### From the Back Cover

We are living in an ever more complex world, an epoch where human actions can accordingly acquire far-reaching potentialities. Complex and adaptive dynamical systems are ubiquitous in the world surrounding us and require us to adapt to new realities and the way of dealing with them. This primer has been developed with the aim of conveying a wide range of "commons-sense" knowledge in the field of quantitative complex system science at an introductory level, providing an entry point to this both fascinating and vitally important subject. The approach is modular and phenomenology driven. Examples of emerging phenomena of generic importance treated in this book are: -- The small world phenomenon in social and scale-free networks. -- Phase transitions and self-organized criticality in adaptive systems. -- Life at the edge of chaos and coevolutionary avalanches resulting from the unfolding of all living. -- The concept of living dynamical systems and emotional diffusive control within cognitive system theory. Technical course prerequisites are a basic knowledge of ordinary and partial differential equations and of statistics. Each chapter comes with exercises and suggestions for further reading - solutions to the exercises are also provided. This second edition adds a new chapter on quantifying/measuring complexity in given systems, together with an introduction to information theory, has an expanded exercises and solutions section, and contains both revised and additional subsections.

#### About the Author

Prof. Claudius Gros holds a chair in theoretical physics at the Johann Wolfgang von Goethe University in Frankfurt am Main, Germany. After completing a PhD in theoretical condensed-matter physics in 1988 at the ETH in Zurich, Switzerland, Prof. Gros went as Chester-Davies fellow to Indiana University, US, before returning to Germany. His present research interests include Cognitive System Theory and Solid State Physics, with emphasis on high-temperature superconductors.

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