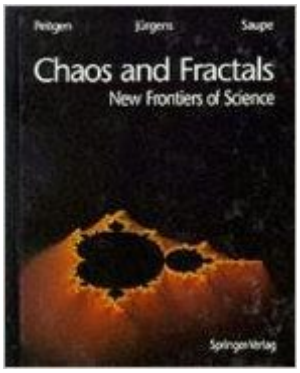
Chaos And Fractals: New Frontiers Of Science



Synopsis

For almost 15 years chaos and fractals have been riding a wave that has enveloped many areas of mathematics and the natural sciences in its power, creativity and expanse. Traveling far beyond the traditional bounds of mathematics and science to the distant shores of popular culture, this wave captures the attention and enthusiasm of a worldwide audience. The fourteen chapters of this book cover the central ideas and concepts of chaos and fractals as well as many related topics including: the Mandelbrot Set, Julia Sets, Cellulair Automata, L- systems, Percolation and Strange Attractors. Each chapter is closed by a "Program of the Chapter" which provides computer code for a central experiment. Two appendices complement the book. The first, by Yuval Fisher, discusses the details and ideas of fractal images and compression; the second, by Carl J.G. Evertsz and Benoit Mandelbrot, introduces the foundations and implications of multifractals.

Book Information

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Customer Reviews

Fascinating and authoritative, Chaos and Fractals: New Frontiers of Science is a truly remarkable book that documents recent discoveries in chaos theory with plenty of mathematical detail, but without alienating the general reader. In all, this text offers an extremely rich and engaging tour of this quite revolutionary branch of mathematical research. The most appealing aspect about Chaos and Fractals has to be its hundreds of images and graphics (with dozens in full-color) used to illustrate key concepts. Even the math-averse reader should be able to follow the basic presentation of chaos and fractals here. Since fractals often mimic natural shapes such as mountains, plants,

and other biological forms, they lend themselves especially well to visual representation. Early chapters here document the mathematical oddities (or "monsters") such as the Sierpinski Gasket and the Koch Curve, which laid the groundwork for later discoveries in fractals. The book does a fine job of placing recent discoveries about chaos into a tradition of earlier mathematical research. Its description of the work of mathematicians like Pascal, Kepler, PoincarÃ©, Sierpinski, Koch, and Mandelbrot makes for a fine read, a detective story that ends with the discovery of order in chaos. (For programmers, the authors provide short algorithms and BASIC code, which lets you try out plotting various fractals on your own.) This is not, however, only a book of pretty pictures. For the reader who needs the mathematics behind chaos theory, the authors in no way dumb down the details. (But because the richer mathematical material is set off from the main text, the general reader can still make headway without getting lost.) There have been advances in the field since this book's publication in 1992, but Chaos and Fractals remains an authoritative general reference on chaos theory and fractals. A must for math students (and math enthusiasts), Chaos and Fractals also deserves a place on the bookshelf of any general reader or programmer who wants to understand how today's mathematicians and scientists make sense of our world using chaos theory. --Richard Dragan Topics covered: Overview of fractals and chaos theory, feedback and multiple reduction copy machines (MRCMs), the Cantor Set, the Sierpinski Gasket and Carpet, the Pascal Triangle, the Koch Curve, Julia Sets, similarity, measuring fractal curves, fractal dimensions, transformations and contraction mapping, image compression, chaos games, fractals and nature, L-systems, cellular automata basics, attractors and strange attractors, Henon's Attractor, RÃ¶ssler and Lorenz Attractors, randomness in fractals, the Brownian motion, fractal landscapes, sensitivity and periodic points, complex arithmetic basics, the Mandelbrot Set, and multifractal measures.

â œIt is relatively discursive and easy to read, with each chapter telling a coherent story, and it highlights the key concepts and ideas, examining a few models in detail and using worked numerical examples as well as visualisations and illustrations â | . makes an excellent entry to the broader mathematics of fractals and chaos, especially for students who are curious about the details as well as the core concepts but donâ ™t want to get bogged down in formal mathematics.â • (Danny Yee, Danny Yeeâ ™s Book reviews, February, 2016) "It is one of the best introductions to chaos and fractals around. â | Unlike some other books on fractals, it can be read by non-specialists â | . The book is beautifully produced and well illustrated so it is a pleasure to read." (Hugh Williams, The Mathematical Gazette, Vol. 90 (5l9), 2006)"The first edition of this vast introduction to chaos and fractals appeared in 1992. This new edition is virtually identical to the original except for some

material â | . the book is â | a wonderful tour of a fascinating area of mathematics, and now the reader can take this tour while carrying around a slimmer (but still hefty) volume. â | The authors have a friendly conversational style â | . This is a great book â | ." (Raymond N. Greenwell, MathDL, May, 2005)"Chaos and Fractals: New Frontiers of Science is an amazing introduction to the ideas of fractal geometry and chaotic dynamics â | . The authors have done a tremendous job in explaining quite difficult concepts in an elegant and simple way â | . I enjoyed this book tremendously â " the authors have put in a tremendous amount of work in making a vast and interesting subject accessible â | . I wholeheartedly recommend this book to anyone with even a passing interest in the subject matter." (Dr. S. Virmani, Contemporary Physics, Vol. 46 (6), 2005)"There appeared many books in the 1980â ™s and early 1990â ™s that â | required only a limited mathematical background to understand. They made the fractals, chaos and the Mandelbrot and Julia sets quite popular â | . The â | book that is under review here is one of these popular books. â | The book will remain what it has been so far: an outstanding book that contains all you ever wanted to know about fractals and chaos accessible to all levels of mathematically skilled." (Bulletin of the Belgian Mathematical Society, Vol. 12 (3), 2005)"The book is written for everyone who wants to learn details of chaos theory and fractal geometry, also for readers who have not much knowledge of technical mathematics. In the fourteen chapters the central ideas and concepts of chaos and fractals are developed â | ." (F. Haslinger, Monatshefte fÃ r Mathematik, Vol. 144 (4), 2005)"This is the second â | edition of what has been a bestseller since its first publication in 1992. â | All the laudatory comments heard twelve years ago about this fascinating book remain entirely valid. No one has succeeded in better presenting â | . the presentation has not aged at all â " the comprehensiveness of the underlying mathematics and the illustrative power of the figures has never been surpassed. Twelve years after its first edition this book remains a must buy." (AndrÃ© Hautot, Physicalia, Vol. 57 (3), 2005)"Numerous books have appeared in recent years that either explore the beauty of fractal art, describe techniques for its creation, or investigate some aspect of the related field of chaotic behavior. The present work attempts to accomplish all three goals in one huge volume...the authors should be applauded for their ambitions undertaking."Â Mathematical Reviews "This book â | contains all one ever wanted to know about fractals, and more. Written byâ "next to Mandelbrotâ "the greatest popularizer of the concept of fractal geometry â | It contains a wealth of information on nearly every angle of the topic... I enjoyed reading the book for its lucid approach, its attempt at completeness, and especially, for the large number of illustrative figures and pictures."Â Zentralblatt Mathematik --This text refers to the Paperback edition.

I purchased this book when it first came out, during theinitial wave of popularity of fractals and chaos theory.Although the fadishness of chaos and fractals has dieddown, a number of solid applications for this theory haveappeared in areas like computer graphics, finance,modeling computer network traffic and data compression.I have purchased a number of books on fractals and chaos andhow these concepts can be applied in a number of areas. Ihave yet to see a better introduction to the topic. This isa core reference and I keep coming back to it again and again.In the spectrum of popular science books, this is definitelyon the technical end. You do not need an advanced backgroundin mathematics as you do for some books on chaos and fractals,but the authors do not shy away from equations. However, theideas are clearly presented. I have used this book as areference for developing software for fractal brownian motionand Hurst exponent estimation."Chaos and Fractals" covers a great deal of material. On a fewoccasions I found that the algorithms or explaination weredifficult to follow. In some cases, like the generation ofGaussian random numbers, I found better, simpler algorithms.When this book was written, fractals and chaos were fairly new.It is difficult to avoid comparing this book to an even thickerbook, "A New Kind of Science" by Stephen Wolfram. Althoughcellular automata, the core topic of "A New Kind of Science"are not exactly new, Wolfram claims new and profoundperspectives. Many, including this reviewer, feel that Wolfram’sclaims are overblown and egotistical (he has a bad habbit ofclaiming credit for innovation, even as he cites other work).The authors of "Chaos and Fractals" do not make exaltedclaims for this work. Yet without any fanfare, this bookreally does deliver profound ideas. This is simply afantastic book. I recommend it for anyone in the appliedsciences (e.g., computer science, quantitative finance,geology, etc...). Even for the mathematically sophisticated itwill provide an valuable overview, which is difficult to obtainanywhere else.

I spent quite a bit of time looking for a good "fractals" book. For me, this is it. It is not a book for everyone, though. I’ll try to offer guidelines to help you decide if it is for you. In summary: (a) its not just a picture book, but extremely visual, (b) its not math-intense but asks for math-comfort and offers options and (c) its not only for computer jockeys, but offers repeated links to that approach.This book is doubtless great for a high-school or college course in fractals. But I think it is also a worthy buy, albeit a pricey one, for a certain type of layperson with a fascination for mathematics presented in some depth. If you enjoy math but find some of the "popularizations" a bit too shallow, then the realm of fractals and chaos is a great place to explore in depth. This is a fine guidebook for that exploration."Chaos and Fractals" is not a book for the reader who is primarily fascinated with the visual representations of fractals. BUT it i!s chock-full of b/w illustrations (686 by

the authors count) and nicely sprinkled with gorgeous color plates. The visual element is not central, but is very strongly represented and I found that almost every important concept was enhanced by the addition of a diagram or illustration.This is definitely a book that delves into the mathematics of fractals. It does so in a well-crafted dual-track form. The core of the book should be comfortable and enjoyable mathematical reading for anyone with a sound and fairly current familiarity with high school math (Not that such "currency" suggests its only for youngsters! This old-timer preserves essentially that level of math by regular exposure to recreational math and the like). On the second track, the book provides mathematically in-depth views of selected topics. This is really nice if you like to stretch your mathematical horizons since you can use the core to steady your foundation understanding of a topic and then dive int!o the advanced mathematical topics at will; mustering strategic retreat when necessary, without loss of face, but sometimes learning how more advanced mathematics can be used.Finally, the book makes an effort to scaffold some computer exploration of fractal concepts that succeeded for me but might not for you. For every chapter the authors provide a "Program of the Chapter" which allows exploration of one or more of the fractal forms and concepts explored therein. These are usually quite short and are written in Microsoft BASIC. This latter might be a problem for some. Nowadays, users with more advanced operating systems might not know where to find their version of BASIC (and it might not even be supplied), much less how to fire it up.I would not belabor the BASIC program element too much except that experimenting with such code is an excellent way for anyone to better understand an algorithmic process. A program is, after all, such a process - a sequence of !discrete steps. I'd urge you to search your Windows disk for something like an "oldmsdos" folder and dig out the Qbasic files found there and fire them up. Even if you've never written a program, this kind of applied-use is a fine way to learn!For the right sort of reader, this is unquestionably a 5-star book.

Thanks to S.J. Will for the tip: Get the FIRST edition (used), as I did and save more than half the price, even of a used copy of this newer edition. Can't compare the two (having not seen the new one) but I can say the color images are very sharp in the older book. As far as content, I too have looked at and bought several books trying to understand fractals. (I am not math-literate, beyond high school algebra.) I found this book most helpful, but NOT easy for the general reader, beyond the first few, introductory pages. As other reviewers have noted, most of it is WAYYYY over the head of anyone who's not a college math major, but skipping through the examples and exercises (some of which are very rewarding if you can stay with it), I found the general explanations, the excitement of the authors, the broader significance of fractals all to be well-worth the price. -- And

hey: at over 900 pages (!) and with FORTY color plates, this book is an astounding bargain. Strongly recommended, even for novices."The Colors of Infinity," based on the video documentary by Arthur C. Clarke is a good introduction to fractals. An enjoyable DVD is included of the original TV program, especially if you learn better by watching and listening. The accompanying animated fractals are fascinating, but frustratingly poor resolution. For a more philosophical approach to fractals, I highly recommend "Heaven's Fractal Net" by William Jackson.

Chaos and Fractals: New Frontiers of Science Fractals: The Patterns of Chaos: Discovering a New Aesthetic of Art, Science, and Nature (A Touchstone Book) Fractals, Wavelets, and their Applications: Contributions from the International Conference and Workshop on Fractals and Wavelets (Springer Proceedings in Mathematics & Statistics) Fractals in Physics: Proceedings of the Sixth Trieste International Symposium on Fractals in Physics, Ictp, Trieste, Italy, July 9-12, 1985 Fractals and Chaos: The Mandelbrot Set and Beyond Chaos and Fractals: An Elementary Introduction Encounters with Chaos and Fractals, Second Edition Playing with Chaos: Programming Fractals and Strange Attractors in JavaScript The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation (MIT Press) Fractals, Chaos, Power Laws: Minutes from an Infinite Paradise (Dover Books on Physics) Fractals, Chaos, Power Laws: Minutes from an Infinite Paradise Frontiers in Health Policy Research: Volume 7 (NBER Frontiers in Health Policy) [Differential Equations, Dynamical Systems, and an Introduction to Chaos [DIFFERENTIAL EQUATIONS, DYNAMICAL SYSTEMS, AND AN INTRODUCTION TO CHAOS BY Hirsch, Morris W. (Author) Mar-26-2012] By Hirsch, Morris W. (Author) [2012) [Paperback] Condensed Chaos: An Introduction to Chaos Magic Own the Wind: A Chaos Novel (The Chaos Series Book 1) Chaos, Gaia, Eros: A Chaos Pioneer Uncovers the Three Great Streams of History Fractals in Science Planetary Science: Explore New Frontiers (Inquire & Investigate) Where Science and Ethics Meet: Dilemmas at the Frontiers of Medicine and Biology