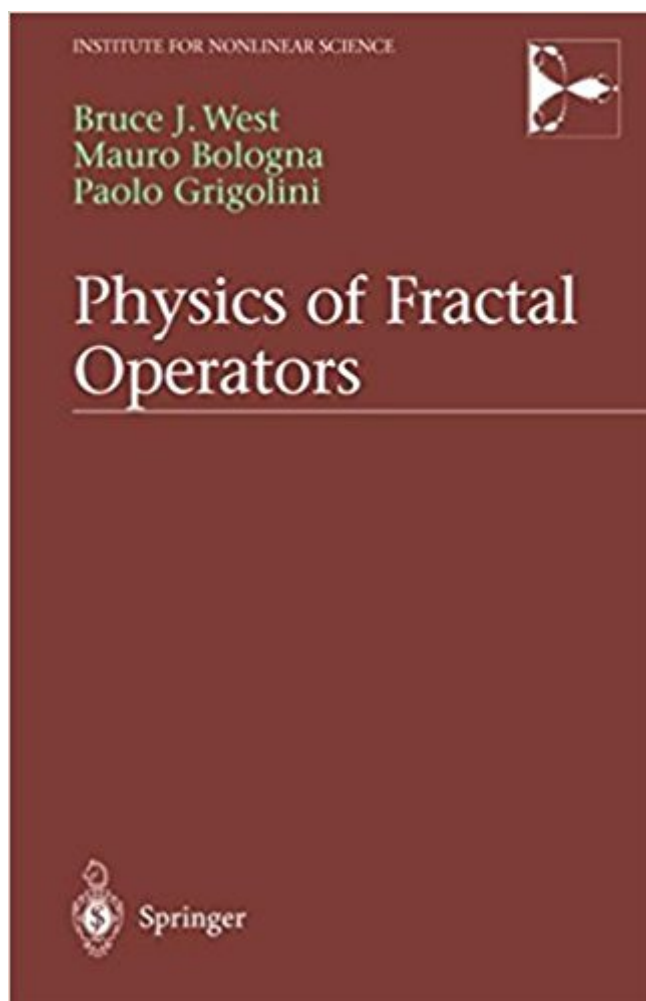


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# Physics Of Fractal Operators (Institute For Nonlinear Science)



## Synopsis

This text describes the statistical behavior of complex systems and shows how the fractional calculus can be used to model the behavior. The discussion emphasizes physical phenomena whose evolution is best described using the fractional calculus, such as systems with long-range spatial interactions or long-time memory. The book gives general strategies for understanding wave propagation through random media, the nonlinear response of complex materials, and the fluctuations of heat transport in heterogeneous materials.

## Book Information

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## Customer Reviews

From the reviews: "Have you ever wondered about whether one can define differential derivative of non integer order and how useful these fractal derivatives would be? If the answer is yes this is the book to look at. The book is written by physicists with a pragmatic audience in mind. It contains a very thorough and clearly written discussion of the mathematical foundation as well as the applications to important and interesting mathematical and physical problems. All the topics are very main stream and of great general relevance... "I am glad I got to know this book. I don't know yet whether fractal calculus will be of crucial importance to my own research in statistical mechanics and complex systems. But I got the feeling from this book that this might very well be the case. And if this happens, I now know exactly where to go for a highly readable and thorough introduction to the field. I think the book deserves to be present in mathematics and physics libraries. And I believe

many interesting undergraduate and graduate projects in mathematics and its applications can start out from this book." - UK Nonlinear News "The book is written by physicists with a pragmatic audience in mind. It contains a very thorough and clearly written discussion of the mathematical foundation as well as the applications to important and interesting mathematical and physical problems. All the topics are very mainstream and of great general relevance. Obviously, the book is also of great relevance to the researcher who may need to become acquainted with Fractal Calculus. I am glad I got to know this book." (Henrik Jensen, UK Nonlinear News, February, 2004) "Physics of Fractal Operators is a timely introduction that discusses the basics of fractional calculus. ... Physics of Fractal Operators, which actively promotes the use of fractional calculus in physics, may help teachers develop an appropriate curriculum. The book's abundance of material makes it very useful to researchers working in the field of complex systems and stochastic processes. It should help those who want to teach fractional calculus and it will definitely motivate those who want to learn." (Igor M. Sokolov, Physics Today, December, 2003) "The main merit of this well-written book is that it brings out rather clearly the relevance of the fractional calculus leading to the fractal operators and fractal functions. Each chapter contains an extensive list of relevant references. The overall style of presentation of the material covered in this book makes it rather useful for physicists and applied mathematicians carrying out a self-study of the fractal calculus and its applications." (Suresh V. Lawande, Mathematical Reviews, 2004 h) "Physics of Fractal Operators is one of the great ideas books of our time. It may well become one of the most influential books with the paradigm of using fractional calculus to describe systems with emerging and evolving fractal complexities becoming widely used across the sciences. This important book should be mandatory reading for all PhD students in physics, and it should be at the side of all scientists working with fractals and complexity." (B I Henry, The Physicist, Vol. 40 (5), 2003) "This book introduces the reader to the interesting mathematical notion of fractal operators and its usefulness to physics. A comprehensive, well written introduction to the subject useful to researchers and teachers alike. It is indeed targeted towards a wide, non specialist audience and provides the mathematical basis of fractional calculus. This book offers a lot of high-quality material to learn from and was definitely a very interesting and enjoyable read for me." (Yves Caudano, Physicalia, Vol. 28 (4-6), 2006)

In the late 90's several people in the fractal world realized that fractal dimension in real values implied that there were fractional calculus operations at work. This fellow got his published years later

because he works for the Army and his co-authors are out of the fractal center at Denton Texas where Dr. Mauldin is in the mathematics department. I have to give these guys high marks for including fractional calculus applied to Levy distributions. First, let me clarify: fractional calculus goes back to the middle 19th century with Fourier and Abel, but the idea of fractional dimensions was only realized in the 30's and 40's. Actual application of fractional calculus to fractal systems only began in the late 1990's. So when this book was published in 2003 it was and probably still is cutting edge material. I know a Chinese fellow who has "rediscovered" this math just lately, who would like this book and a Mathematica using German professor who is in Egypt that would like to have a copy as well. The demand is international and this "supercalculus" is the mathematics of the 21st century. I really wanted to give this book low marks, but could bring myself to do it. This kind of work really needed to be published.

I think it should be "Fractional Operators". Fractal is a static, geometrical concept while "fractional operator" is dynamic and evolving. I love this book. Bruce West influenced my understanding of fractional dynamics. I made a whole collection of B J West's works. If any one interest a copy, contact me "yqchen@ieee.org"

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