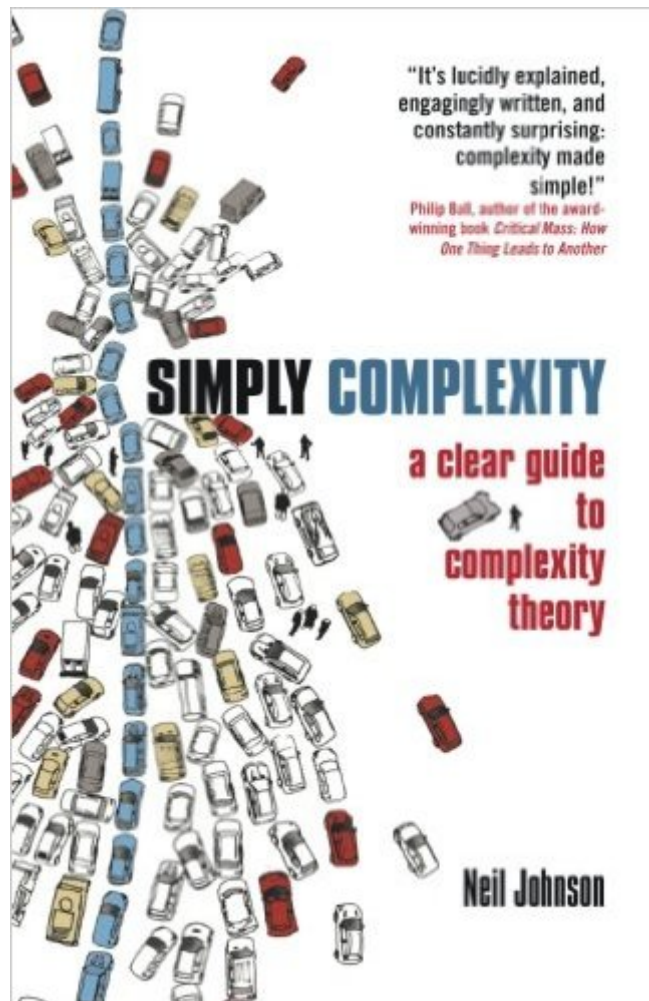


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# Simply Complexity: A Clear Guide To Complexity Theory



## Synopsis

What do traffic jams, stock market crashes, and wars have in common? They are all explained using complexity, an unsolved puzzle that many researchers believe is the key to predicting and ultimately solving everything from terrorist attacks and pandemic viruses right down to rush hour traffic congestion. Complexity is considered by many to be the single most important scientific development since general relativity and it promises to make sense of no less than the very heart of the Universe. Using it, scientists can find order emerging from seemingly random interactions of all kinds, from something as simple as flipping coins through to more challenging problems such as the patterns in modern jazz, the growth of cancer tumours, and predicting shopping habits.

## Book Information

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## Customer Reviews

If you are unfamiliar with Complexity Theory ("The Science of Sciences") then this is a great book to start with. Neil Johnson has done an impeccable job of keeping the intricacies of Complexity within a very manageable framework that any layman can understand. Take this quote for example: "Complexity can be summed up by the phrase "Two's company, three is a crowd." In other words, Complexity Science can be seen as the study of the phenomena which emerge from a collection of interacting objects - and a crowd is a perfect example of such an emergent phenomenon, since it is a phenomenon which emerges from a collection of interacting people." The real strength of this book lies in Johnson's unsophisticated and plain approach towards Complexity Science which he

couples with many real world examples. But neither does Johnson leave anything out; Self-Similarity, Fractals, Power-Laws, Networks, etc. - it's all here. My only complaint about this book comes on page 100. Here, Johnson explains how the "six degrees of separation" network was conceived by Stanley Milgram in 1967. I am sure that Johnson knows that this was debunked by later research, but Johnson fails to mention this in the book (one only has to look to Wikipedia, Complexity: A Guided Tour by Melanie Mitchell or The Numbers Game: The Commonsense Guide to Understanding Numbers in the News, in Politics, and in Life for confirmation).

Complexity science is a broad field with vague boundaries, so no single book can cover the whole field in depth. In this book, Neil Johnson focuses on a definition of complexity associated with a particular class of computational models, and he describes these models and their resulting behaviors at a level suitable for the general reader (somewhat detailed descriptions, but essentially no formal math). He has a PhD in physics and has himself done considerable research on these types of models (see the references at the end of the book), so his knowledge in this area is fairly authoritative. For Johnson, a complex system has the following characteristics: (1) A population of multiple (at least three) interacting objects or "agents" which typically form a network. These objects may be very simple, but they don't have to be. (2) Competition among the objects for limited resources. As part of this overall competition, there can also be local cooperation within the system. (3) Feedback processes, which give the system memory and history. (4) Ability of the objects to adapt their strategies in response to their history. (5) Ability of the system to interact with its environment. (6) Self-organization of system behavior, without the need for a central controller. (7) Emergence of non-trivial patterns of behavior, including a complicated mixture of ordered and disordered behavior. This can include chaotic behavior, as well as extreme ordered behavior (eg, traffic jams, market crashes, human diseases and epidemics, wars, etc.). Johnson gives many examples of complex systems, and a jazz band is among the most interesting of these examples (the jazz performance is the behavior of the system).

The book is composed of two parts: the first titled "what exactly is complexity theory?", and the second "what can complexity science do for me?". While I pretty much liked the first part, I got some mixed feeling with respect to the second which I'll try to explain below. Part one describes the ideas behind the complexity field of research, its properties and provides some toy examples (such as mob behavior). The text is very clear, easy to follow and explained in a way that \*anyone\* can follow. On a personal note, while most was already known to me, I really enjoyed the Jazz music

analogy in chapter 3. Generally, this part was very interesting; I was missing some discussions about the differences between the complexity theory and other related (or equivalent) ideas that can be found under different umbrellas such as "agent based models", "multi agent systems". The problem starts with Part two of the book. In this part the goal of each chapter (six of them) is to show the application of the complexity ideas to various domains: from financial markets, through warfare and terrorism, to quantum physics. My criticism is that while the author spends lots of space to describe each model, he makes very little effort to discuss the results/theorems/conclusions that can be derived from the model and their impact on reality. That is, we learn to appreciate the nice model for couple of pages but then, as the model is an extremely simplified description of reality, I kept baffling at what valuable information can be actually derived from it. The author, with only few vague sentences about the actual impact of the model, does not make a good point with that regard.

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