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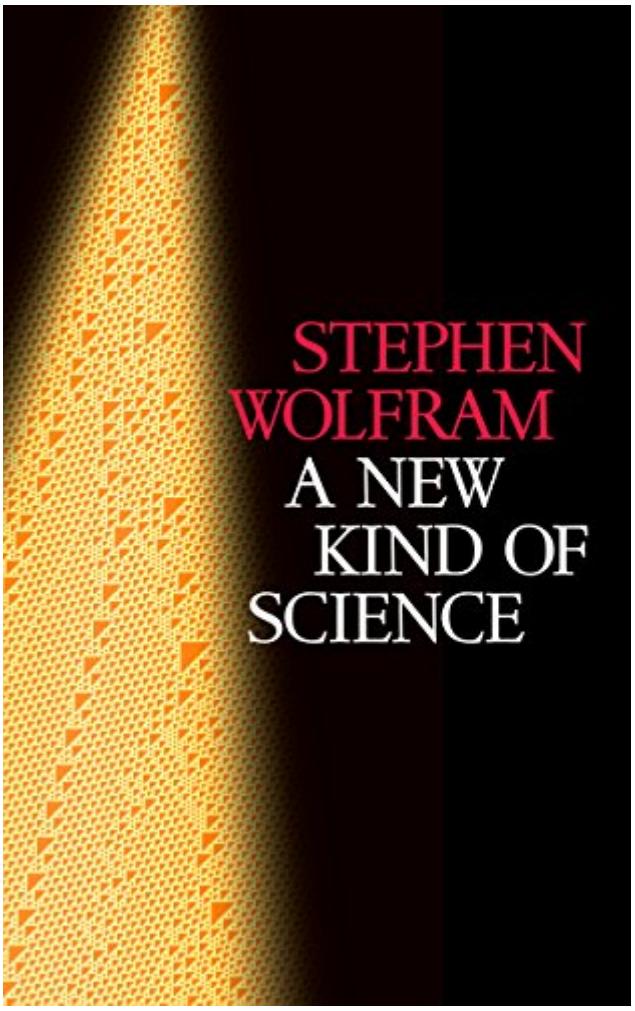
A New Kind Of Science



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Synopsis

This long-awaited work from one of the world's most respected scientists presents a series of dramatic discoveries never before made public. Starting from a collection of simple computer experiments--illustrated in the book by striking computer graphics--Stephen Wolfram shows us how their unexpected results force a whole new way of looking at the operation of our universe. Wolfram uses his approach to tackle a remarkable array of fundamental problems in science, from the origins of apparent randomness in physical systems, to the development of complexity in biology, the ultimate scope and limitations of mathematics, the possibility of a truly fundamental theory of physics, the interplay between free will and determinism and the character of intelligence in the universe. Written with exceptional clarity, and illustrated by nearly a thousand original pictures, this seminal book allows scientists and non-scientists alike to participate in what promises to be a major intellectual revolution.

Book Information

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Customer Reviews

Well it looks like he has succeeded in polarizing opinionMany of the comments of the critiques are trueThe ego is there, he admits it, it is little disconcerting but being the history of a certain amount of

Hubris myself in my time (and definitely less deserving than Wolfram) I can forgive that.I am not expert enough to refute some of the more dogmatic claim of plagiarism etcBut the main thesis do find intriguing and thought provoking. If I have read these concepts elsewhere, they were not as clear illustrated and explained as they are in this bookThe main idea that Simple computational rules can generate complex, random-looking behavior deterministically is intriguing to me. It cuts to the core of my intuition and teaching as a Statistician. It making me think and consider different interpretations of what I might be seeing. As a work of philosophy this is an awesome achievement. As a work of science I donÃƒÂ¢Ã â ¬Ã â„¢t think itÃƒÂ¢Ã â ¬Ã â„¢s there yet but I think this does raise some genuine and surprising possibilities.The Book is an awesome value with high production values. It cannot be attacked all at once. It needs to be revisited many times. He covers a lot of ground ÃƒÂ¢Ã â ¬Ã â œ you donÃƒÂ¢Ã â ¬Ã â„¢t have to cover it all with him. Find your interest and I think wolfram will provide you with a new perspective on it

Although I think there is merit in looking for simple fundamental mechanisms to explain nature this book could have been reduced to a 8 page pamphlet to thoroughly explain his concepts. If you sorted the words in this book around one hundred pages would be filled with the word "I". There is nothing Earth shaking here just some basic cellular automata and lots of really boring-you-to-tears examples.

In this gargantuan treatise, which has appreciable gravitational pull, the author introduces the reader to the tools and science of cellular automata. Some of the proposals in the book are radical (such as the Principle of Computational Equivalence), some fairly conservative, and some unjustifield, but it does serve to introduce cellular automata from the standpoint of an individual who has been very active in their study and development. The book is long, and space does not permit a detailed review here, but one can read the book in its entirety in a fairly short time frame since the margins are large and there are an abundance of diagrams in the book which take up page space. Also a very large (338 pages) part is devoted to notes in the back of the book. Different viewpoints on science and mathematics require both formal and empirical justification. The author does this in some areas of the book, but not all, and the ones left open are left to the reader to speculate on. Because of this it is not clear the book will have a major influence on scientific research. One would want more examples of the power of cellular automata in solving difficult problems in mathematics and science before deciding to use them in the everyday practice of scientific research. Throughout the book, the author repeatedly suggests that simple rules in cellular automata can result in complex

or "random" behavior, but never really quantifies what he means by randomness. The patterns generated "seem" random to him, as he says repeatedly, but other readers may disagree. He attempts to define it more precisely in his discussions on the processes of perception and analysis, but again the discussion is purely qualitative. In addition, the rule for generating the patterns is known in advance. In actual research however, one is given a collection or pattern of data and attempts to discover the rules behind it. Thus all of the patterns in the book are really quite simple, since the rules are known for generating them. If one is given one of these patterns without knowing the rules, it might be very difficult to find these rules. Such is the headache of modern science. Also, randomness is a concept that depends on the time scale chosen. Transient behavior of physical systems may appear random on short time scales, but for long time scales the system approaches periodic or quasiperiodic behavior. Also, sometimes one can "quench" apparent randomness in a system by a transformation of coordinates, which says that behavior that looked random was only due to a particular coordinate system chosen to characterize the system. The author does distinguish three mechanisms for randomness, one being an explicit introduction of randomness into the rules of the system; another being randomness in the initial conditions; and the third being randomness from the environment. The discussion is purely qualitative and leaves the reader wanting as to what tools are needed to detect or distinguish these forms of randomness from each other in the time evolution of the system under study. The detection and use of noise in physical systems is of course of paramount importance to applied science and engineering, and practitioners in these areas will need a more quantitative presentation than what is given by the author. It is clear that the author considers "randomness" as being in some sense fundamental or ontological, since the seemingly random behavior of discrete systems can produce for example, interesting behavior, such as mathematical continuity. Even the characterization of systems or rules as "simple" can be quite difficult to define from a fundamental point of view. The concept of Kolmogorov complexity has shown some headway in defining simplicity, but its elucidation has been omitted from the book, no doubt because of its use of "traditional" mathematics, which the author has steadfastly avoided in the book. There are many examples in "traditional" mathematics however that give the kinds of behavior the author finds fascinating, many of these found in the area of dynamical systems. And here again, the complexity of a problem or system may be dependent on the vantage point of an observer. The inability of "Eve" to decipher the elliptic curve factorization choices of "Bob" and "Alice", makes Eve’s situation very complex from her standpoint. Bob and Alice however have chosen a procedure based on a "simple" group operation on elliptic curves. Interestingly, the author has not chosen to discuss quantum computation in this book, in spite of its current importance. His

claim that that the Principle of Computational Equivalence is a law of nature that will prohibit systems from carrying out computations more sophisticated than cellular automata and Turing machines suggests that quantum computers can be reduced to these systems, a claim that is profound but difficult to prove. Quantum mechanics and quantum field theory are discussed briefly in the book, but no in-depth suggestions are given as to how to apply cellular automata to resolving difficult and nagging problems in these areas, unfortunately. Speaking now independently of the content of the book, it was written and then delivered to its readers outside the confines of peer-reviewed academic journals. The author is to be applauded for this move, for it shows an independence of spirit and follows a trend that hopefully will increase in the decades ahead. With electronic publishing and Internet postings of scientific results, this leaves readers the privilege of making up their own minds as to the scientific worth of a particular document. Thus one can read this book as the author intended it, and free from the influence of anonymous referees. The author has written it, marketed it, and put his name on it, and he clearly is, and should be, proud of his many achievements to this date. One can disagree with the content of this book, but it is an attempt to view things from a different point of view, and 21st century science needs more of this, not less

Very nice

Very good book. I read the reviews, but I see they are really unjustified.This is an excelent book.

Re-reading after 15 or whatever years since it was first published. I forgot what a pompous load of hogwash it is. Still, pretty pictures of interest to computer scientists. And yet sometimes ... I think he is on to something, but it is such as abstract concept (computational equivalence) that it seems to lack any predictive power (and hence fails a critical test as a scientific theory.) It is really about epistemology and is not at all a new kind of science. The upshot - buy it used.

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