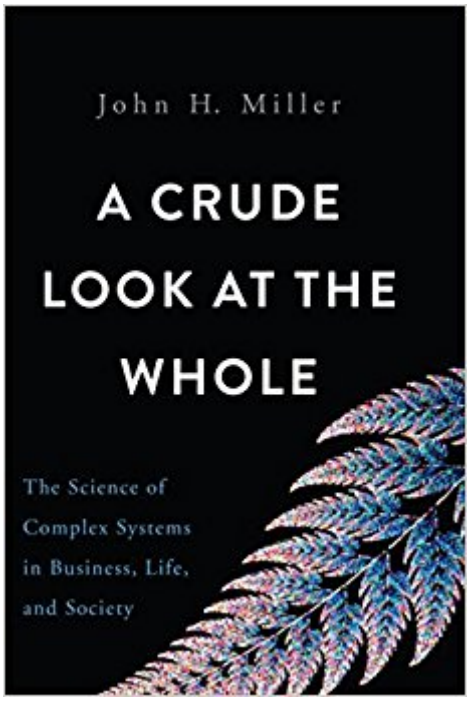
A Crude Look At The Whole: The Science Of Complex Systems In Business, Life, And Society



Synopsis

Imagine trying to understand a stained glass window by breaking it into pieces and examining it one shard at a time. While you could probably learn a lot about each piece, you would have no idea about what the entire picture looks like. This is reductionism—the idea that to understand the world we only need to study its pieces—and it is how most social scientists approach their work.In A Crude Look at the Whole, social scientist and economist John H. Miller shows why we need to start looking at whole pictures. For one thing, whether we are talking about stock markets, computer networks, or biological organisms, individual parts only make sense when we remember that they are part of larger wholes. And perhaps more importantly, those wholes can take on behaviors that are strikingly different from that of their pieces.Miller, a leading expert in the computational study of complex adaptive systems, reveals astounding global patterns linking the organization of otherwise radically different structures: It might seem crude, but a beehive's temperature control system can help predict market fluctuations and a mammal's heartbeat can help us understand the “heartbeatÃ¢â ¬Â• of a city and adapt urban planning accordingly. From enduring racial segregation to sudden stock market disasters, once we start drawing links between complex systems, we can start solving what otherwise might be totally intractable problems.Thanks to this revolutionary perspective, we can finally transcend the limits of reductionism and discover crucial new ideas. Scientifically founded and beautifully written, A Crude Look at the Whole is a powerful exploration of the challenges that we face as a society. As it reveals, taking the crude look might be the only way to truly see.

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Customer Reviews

A few years ago Stephen Hawking was asked what the most important science in the 21st century would be, and he instantly replied "the science of complexity". Hawking is right. The last five hundred years have seen an amazing explosion of progress in most of the traditional sciences: physics, biology, chemistry, mathematics, astronomy and others. But what is lacking is an understanding of how one science builds on top of another and leads to the universe we live in. Many of the most urgent problems confronting us - the brain, financial markets, healthcare, climate change, terrorism, the large-scale structure of the universe - involve probing connections between various phenomena rather than the phenomena themselves. This understanding of interconnections between various sciences leads to the science of complexity.John Miller’s book tackles complexity in its broadest sense by considering a dazzling variety of complex systems, from neurons to honeybees, from irrigation canals in Bali to stock markets, from drug cocktails to manicured lawns in suburbs. His idea is to devote each one of the chapters in the book to a few examples which taken together illustrate a central feature of complex systems. Thus, the various chapters deal with hallmarks of complexity such as feedback, network effects, self-organized criticality, noise, scaling laws and cooperation. None of these qualities are independent of each other, each one builds on top of the other. The title of the book - "a crude look at the whole" - is actually a quote from the physicist Murray Gell-Mann and it very accurately describes how we need to deal with complex systems. We do need to take a look at the whole, but this look also cannot be too fine-grained; it needs to be pointillistic and crude.Some of the examples which Miller uses to illustrate these qualities of complex systems are fascinating. For instance he talks about how the concept of rugged landscapes where making errors (adding noise) can actually lead to more productive outcomes helps one design drug cocktails for complex diseases like cancer and AIDS. Similarly he talks about how both positive and negative feedbacks can cause huge changes in financial systems: he uses the examples of both the great market crash of 2008 and the ’flash crash’ of 2010 to describe such sensitive feedbacks. When talking about heterogeneity vs homogeneity, Miller posits that heterogenous systems can be potentially more resilient to shocks because of differential reactions to stimuli, but homogenous systems may be easier to manage.The book also illustrates how simple

intelligence is not limited just to human beings by citing the example of slime molds and bacteria which can perform very complex tasks that are mediated through relatively simple molecular interactions. This discussion leads to one on self-reproducing automata in the chapter on cooperation - one of the best in the book. Miller sets up an abstract model based on intelligent agents which can either defect or cooperate. Seen through the lens of the classic prisoner's dilemma of game theory, a somewhat involved analysis shows us that defection (or selfishness) can make us somewhat better off in the short term while cooperation can make us much better off in the long term. Another fascinating example of cooperation comes from Balinese agriculture. The Balinese people have built a complex system of irrigation canals, aqueducts and terraced agriculture. There are upstream and downstream farmers in the system, and the upstream farmers can decide to withhold water from the ones downstream for their own benefit. However it becomes clear that in order to utilize water most efficiently as well as to fight pests, a cooperative strategy in which the water is judiciously shared can work best. This kind of analysis has very important implications for understanding and engineering all kinds of systems, from predator-prey networks to urban communities.Scaling laws are another very interesting aspect of complex systems. These are essentially power laws that relate various aspects of a complex system to one of its basic features. Over the years researchers have observed remarkable similarities in scaling laws over multiple components of a system. For instance in case of animals, important features like metabolic rate, height, heartbeat rate and reproductive capacities are simple power functions of the animals' masses, and this trend holds irrespective of what animal we are talking about. Similarly the size of cities is observed to be related to disparate parameters like electricity and fuel consumption, waste disposal, crime rates and transportation efficiency. Thus whether in case of animals or cities, knowing one critical parameter can allow you to estimate many others. This principle shows us that while simple systems can often be very complex, supposedly complex systems can also lead themselves to relatively simple laws. Finally, self-organized criticality refers to the kind of "tipping points" that Malcolm Gladwell has talked about. The idea is that sometimes a single, relatively trivial phenomenon can tip a system into a complex new state: examples include phenomena as different as the behavior of sand piles, the Arab Spring and the fate of Mayan civilizations.The one limitation of the book is that sometimes it slides over too easily into jargon that will be impenetrable to an an uninformed layman; I myself had trouble understanding some of the analysis of financial systems for example. Nonetheless, this limitation is not significant if one looks at the book not as a comprehensive and self-contained treatise but as a tour of topics in complexity and as an invitation to further study. The tour shows us how each rung of the natural and social sciences is truly

connected to each other, how hidden relationships can explain relationships between neutrons and neurons, between ants and market players, between urban communities and sand piles. Most importantly, it shows us how the great age of reductionism which unearthed so many truths about the world by breaking it down into parts and understanding these individual parts must now be complemented by one in which we understand systems not by breaking them down but by building them up and understanding their connections. The book is really an invitation to a future which should excite all of us.

In truth, a book with this title should have more than 500 pages. Complexity Sciences being so rich, nurtured by so many contributions coming from all sciences ÃƒÂ¢Ã â ¬Ã â œincluding socialÃƒÂ¢Ã â ¬Ã â œ it feels like the book presents a too narrow perspective.The author manages, nonetheless, to give an overview of diverse systems ÃƒÂ¢Ã â ¬Ã â œnone of them having neuronsÃƒÂ¢Ã â ¬Ã â œ that behave following similar principles and rules and that, the reader will be convinced, think and make decisions. It really makes a case for the central pretension of complex sciences, which is that leaving aside idiosyncratic aspects of a system, one can find truths also valid in multiple other systems, regardless of their differences in molecular composition (they could even be immaterial) or scale, and that complexity is really the 'study of everything'.Markets, single cells, agents with cooperative dilemas, hives or algorithms finding low energy states in a group of molecules; systems that could be found in nature or culture, artificially set on a laboratory or simulated on a computer; they all run equivalent rules that allow them to explore solution landscapes, plagued with dangerous mediocre local maxima, for which these systems deploy surprisingly similar strategies to escape. Fascinating.

Excellent book about complexity science. Readable, clear examples, insightful understanding of the usefulness of complexity methodology. This kind of work deserves more attention, as probablistic models deserve wider application. Discrete causal science has its place, because it gives clear answers that are more intellectually satisfying, but complexity is a much better snapshot to focus on the dynamics of the messy, uncertain world of information we actually work with in most of our endeavors.

OK book if you know nothing about complexity theory. However, my impression is that most people in technical/scientific fields will be familiar with the concepts presented. As such, 3* for an expensive but shallow overview. The style is fine, explanations fine. Many readers will wonder 'where's the

beef?'

Well written look at the whole subject of complexity. I spend a lot of time thinking about how to keep businesses relevant in the marketplace. This book added a new level of understanding of how that probably works. I will buy something that dives deeper into the subject of complexity now.

A great book, offering an amazing journey through complex systems. I found gems of examples that I can relate directly to business, rationalizing highly complex set of systems and players as a whole single entity rather than just as a sum of the parts. Truly amazing.

A comprehend review of complexity theories and its application. Very succinct and readable. Good introduction to complexity theory. Highly recommend.

Broad scope in a small book. Needed to be bigger, but a great book overall.

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