



Sync: The Emerging Science of Spontaneous Order

Steven H. Strogatz

Download now

Read Online 

Sync: The Emerging Science of Spontaneous Order

Steven H. Strogatz

Sync: The Emerging Science of Spontaneous Order Steven H. Strogatz

At the heart of the universe is a steady, insistent beat, the sound of cycles in sync. Along the tidal rivers of Malaysia, thousands of fireflies congregate and flash in unison; the moon spins in perfect resonance with its orbit around the earth; our hearts depend on the synchronous firing of ten thousand pacemaker cells. While the forces that synchronize the flashing of fireflies may seem to have nothing to do with our heart cells, there is in fact a deep connection. Synchrony is a science in its infancy, and Strogatz is a pioneer in this new frontier in which mathematicians and physicists attempt to pinpoint just how spontaneous order emerges from chaos. From underground caves in Texas where a French scientist spent six months alone tracking his sleep-wake cycle, to the home of a Dutch physicist who in 1665 discovered two of his pendulum clocks swinging in perfect time, this fascinating book spans disciplines, continents, and centuries. Engagingly written for readers of books such as *Chaos* and *The Elegant Universe*, *Sync* is a tour-de-force of nonfiction writing.

Sync: The Emerging Science of Spontaneous Order Details

Date : Published March 5th 2003 by Hachette Books (first published 2003)

ISBN : 9780786868445

Author : Steven H. Strogatz

Format : Hardcover 352 pages

Genre : Science, Nonfiction, Mathematics, Physics, Philosophy, Popular Science, Biology, Sociology, Psychology, Computer Science

 [Download Sync: The Emerging Science of Spontaneous Order ...pdf](#)

 [Read Online Sync: The Emerging Science of Spontaneous Order ...pdf](#)

Download and Read Free Online Sync: The Emerging Science of Spontaneous Order Steven H. Strogatz

From Reader Review Sync: The Emerging Science of Spontaneous Order for online ebook

Aditya says

A great discussion of the all-pervasiveness of synchrony born out of non-linearities in systems. The anecdotes and occasional words of advice made the book all the more fun to read. This book would be liked by people interested in dynamical systems, inter-connectedness of apparently disparate scientific fields, and having a unified scheme of understanding the universe.

Panz says

Probably the best book I've read this year. So many OMG moments

Varad Deshmukh says

Steve Strogatz has gained popularity with his textbook, "Non-linear Dynamics and Chaos". I would say that his non-academic work, "Sync: The Emerging Science of Spontaneous Order" is an equally smashing hit. "Sync" explores the idea of how spontaneous synchronization arises in the chaotic turbulent lives/non-lives of diverse entities. Why do fireflies synchronize their flashing in the dark or how do crickets chirp in unison? Why do we wake up at almost our usual time, even after an all-nighter? Why do certain fads gain popularity in the market, while some die down quickly? Why did the Millennium Bridge start shaking when an unruly group of people stampeded it on inauguration day? These are some of the questions that Steve Strogatz addresses in this book.

I was really impressed with this book on so many fronts. As a computational science enthusiast, this book was a special treat for me. Strogatz fills the chapters with narratives where computers are used extensively for modeling various phenomena -- coupled biological oscillators, Josephson junctions, sync across social networks, chaotic synchronizers. The idea of a computer model seems almost banal by now, but Strogatz's experiments go way back when they were not so common. Strogatz's narration style is very gripping, and he generates sufficient suspense through his various experiments before giving the reader the thrill of successful result outcomes.

The applications covered in the book are diverse -- synchronous flashing of fireflies, the alpha rhythm of the brain, the circadian body clock, planetary and quantum sync, communication security, sync across the human network, to name a few. Since the applications and underlying mathematics is diverse, Strogatz handles the basics of each topic before he connects it to a sync problem. The descriptions are pretty layman, even to the point that not a single equation is provided in the book. My only complaint is that the book lacks pictures sometimes where they are necessary. At some points, I felt a diagram would have relieved the burden of description both on the writer and the reader.

Strogatz hopes in the epilogue of his book that he's given the reader a sense about how thrilling it is to be a scientist. I think he has. For starters, this book straddles across the boundaries of so many "fields", giving it a heavily interdisciplinary focus. For a problem in any application, Strogatz recounts many problems in other

????????????3?????3?1???????????? ?????????????????????????????????
??3????????1?
????????3??
??
??3?1?????????
??
??
??

??John Chambers????? ?George
Wetherill??
??
??
????????????????????Alessandro Morbidelli?????-? ???Jonathan Lunine????????????????
??
??
??
??

.....
??
??
??
?“”??
??
??
.....

Gendou says

This is a great multi-disciplinary science book!
The reader is introduced to phenomena from many disciplines.
These phenomena are well-modeled by similar mathematics using non-linear oscillators.
The book requires little math knowledge, but it helps.
I plan to write my own computer simulations for some of these phenomena, and will link them to this review when I'm finished! :)

I do have one heated criticism of this book:
Strogatz defends Josephson's regurgitation of the most certainly incorrect view that quantum mechanics can somehow explain the para-normally supposed (and repeatedly experimentally verified to be non-existent!) phenomena of telepathy.
There are so many things wrong with this digression, I hardly know where to start.
Josephson did good work and was awarded a Nobel Prize. He's wrong about telepathy and all the other pseudo- and anti-science he's been dabbling with since.
Strogatz argues that the "allergic" response by the scientific community is a fault.
He couldn't be more wrong.
It's a virtue, and an important one.

To use a hyperbolic analogy (the likes of which Strogatz seems quite fond of), this reaction by the scientific community is indeed analogous to an immune response.

In this case, however, it is the body of science fighting off the infection of the cancerous mysticism. So, reader beware, Strogatz has made a huge mistake here!

Louisa says

The spectacle of synchrony in nature is one of those mysteries that strike a chord in us. Fireflies blinking on and off in unison. Schools of fish moving gracefully as if they were only one. Pacemaker cells in a heart working all together to make that heart beat. Menstrual cycles of female roommates and co-workers starting to match each other over time (yes, it's true!) And then there's the synchronization between things that aren't even alive: photons that align to form a laser beam; electrons marching in step in a superconductor; the moon turning on its axis at precisely the same rate as it circles the earth; and pendulum clocks that hang next to each other adjusting their periodic swaying, as Christiaan Huygens observed, "in a kind of sympathy".

Mindless, lifeless things can sync spontaneously, says Steven Strogatz, because *the capacity for sync does not depend on intelligence, or life, or natural selection. It springs from the deepest source of all: the laws of mathematics and physics.* Using math, Strogatz shows why synchrony is likely to happen in nature, and why in some cases it is inevitable. This is wonderful, fascinating stuff, and perhaps the best part of all is that there is still so much more to discover. We can't explain it all, admits Strogatz in the end: *maybe we instinctively realize that if we ever find the source of spontaneous order, we will have discovered the secret of the universe.*

Yes, maybe.

Ariel says

This book is excellent. At the end of each chapter I found myself saying "wow", Strogatz has an engaging not too sciency writing style and frankly, it has made me appreciate math more.

Studying math I always felt that the deeper point of it was shrouded for me. I think if I had read this and realized how deeply math was interconnected with everything (I guess I knew that, but seeing how it works on the outer reaches of science really makes it clear) I probably would have done better at it. The book runs all over recent scientific history alternating between scientific explanations, autobiography and history of the field. We learn about circadian rhythms, heart cells, lasers, and fireflies flashing in sync among other things. Strogatz has certainly done some amazing work but whenever he mentions work by other he always seems to acknowledge in a very positive way everyone who was involved, down to the lowly grad student.

I also got an introduction not only to sync as a scientific field but its relationship to chaos, quantum and complexity theory.

Did I mention that I think this book is amazing?

Jeff says

This book is an interesting look at a number of phenomena that aren't as curious as the author makes them out to be.

The book focuses on instances of "spontaneous order-seeking" in nature. Cases where things start irregular, but tend towards an equilibrium which is ordered. Now, before you go jumping about the Second Law of Thermodynamics, he's claiming this for living systems, and at the macroscopic level -- he's talking about things like certain species of fireflies which spontaneously synchronize their flashes, or about how women will begin to cycle together if they live in close proximity. So there's agency involved in here, he's not claiming that some types of pottery shards, when dropped, will spontaneously rearrange into a dish.

He doesn't get terribly in-depth into these subjects (it's not a journal article), but he does have lots of interesting examples, and discusses the kinds of information/communication problems that have to be overcome for this kind of syncing-up to work. I'd recommend this book.

Mac Hull says

A great multi-disciplinary introduction to the idea of complex systems obtaining order in a spontaneous way. It's funny that it seems like, at least to me, about half the reviews say they couldn't fully grasp all the ideas in the book while the other half claim it isn't technical enough. Some of the descriptions can be slightly hard to follow, but i think he does an outstanding job of helping the reader to visualize incredibly complex concepts. Personally, I'd rather the book be for the layman in the hopes that it could peak the interests of anyone despite their mathematical backgrounds. By making the book accessible to all, anyone can revel in the beauty of the universe that is often overlooked by the naked eye, despite the complexity of the concepts. These are concepts that, IMO, everyone should be aware of on some level because they permeate every scale and corner of the universe and are applicable to every discipline, concept, system, or part of everyday life. It's just a wonderful way to think... If it isn't technical enough, or even too technical, you can always use it as a launching point to explore whatever interests you the most since the book covers such a wide range of spontaneous order. Some math background (high school) definitely helps but is not completely required.

This book might but a 4 star, but i decided to be generous. Yea, yea, many of the analogies do not convey the true complexity of the theories they are describing, but that's because they simply can't. As I already said, you can always choose to dig deeper into any concept he presents. Generally, the concepts discussed are all tied together well, if not for a couple momentary lapses, and he writes clearly. I'm generous with my rating simply because I really enjoy concepts like sync, complex systems, chaos theory, etc. that seem to permeate reality at all levels. It's my belief that everyone, no matter their walk of life, should have some kind of awareness of pervasive natural laws that describe ourselves and everything around us as it can lead to understanding and acceptance, as well as insight into almost any issue. The multidisciplinary approach of this book really helps bring out that pervasiveness and highlights the idea of some fundamental connectedness between all things that can be formulated. The far left and right of a distribution of people based on scientific knowledge just may find themselves bored at times, but an open minded approach to this book opens many doors for subsequent research and, most importantly, new ways of thinking.

David says

This is a very entertaining book. I enjoyed every chapter of the book. I was especially intrigued by the biological rhythms--fireflies and human sleep cycles. And I thoroughly enjoyed the step-by-step history of how the mathematics of coupled oscillators was worked out.

As previous reviewers have mentioned, the book could have been helped by additional charts and diagrams--and even perhaps some equations. It is difficult to imagine some of the patterns the author describes, without some concrete reference. It would have been especially helpful in the chapter on chaos, when describing coupled strange attractors.

The chapter on networks seems like a summary of a much more detailed book, *Linked* by Albert-Laszlo Barabasi.

So, if the subject of networks intrigues you, I highly recommend that book, too.

Karan Kurani says

Great insight into the phenomenon of sync and how hard it is to decipher non linear dynamic systems.

The part before the final couple of chapters is a slog to go through and not as interesting as the rest of the book.

Overall, a great read and recommended for people who want to read new things going on in the scientific world.

Roberto Rigolin F Lopes says

Strogatz goes around showing us synchronization everywhere. He means everywhere in the whole universe. From small fireflies to big moons. Atoms and humans are also mentioned. For example, superconductivity and water freezing are just synchronization of atoms. Hey, you will feel his passion for the subject throughout his book; he is madly in love. Sometimes even throwing mind-blowing ideas around fun explanations on how order arises from chaos.

Ryan says

I read this book on the advice of an old friend who studies neuroscience. I have occasion to deal with synchronization problems in my own life, so I thought it would be fun to read about the science of it. And it was!

If you've ever wondered about why your sleep patterns are they way they are, or why when you try to go to bed early you end up with terrible insomnia, or how fireflies all flash at the same time or the 6 degrees of Kevin Bacon, this is the book for you. It's the kind of book with surprising enough stuff to tell your spouse or lunch friends about (as I did). The information is presented pretty clearly, with decent metaphors to deal with the inexpressible (at least w/o mathematics). Chaos lovers will find a lot of discussion about non-linear dynamics, as Strogatz is a leader in that field. It helps to have some basic exposure to modern physics topics in places.

My '4' rating is really for the information in the book. The writing is pretty good for a Math professor, but there are places where it gets a little awkward. (probably would give it a '3') I've read enough "popular" science books to no longer get all excited with stories about the "search" for something. Sentences that begin

"I then called my buddy, so-and-so at Harvard. We spent summers together blah blah blah..." are not my favorite. But there's not much of that here. All-in-all a pretty fun read.

Tina says

When I got to the 003s, I was a bit scared. They were all science, which I have struggled with since high school chemistry. I selected, after several minutes of debate, Sync because I thought it was about chaos theory, which I had seen in an episode of CSI: Original Flavor, which made it some what interesting to me. I am pretty sure that in some ways Sync is indeed about chaos theory. At least the author began discussing chaos theory about a third of the way through the book. But I don't really know for sure what Sync is about. This is, I'm sure, through no fault of the author, I just have no real understanding of science. I do wonder though, why Sync is in generalities rather than science. Is it because they wanted to introduce some chaos to the Dewey decimal system? Or, more likely, is there some flaw in the book similar to the one in my 001 book? I picked up on that flaw instantly because, after all history is my subject and I know the rules. Despite my lingering questions, Sync was interesting. The author did a very good job of using metaphor to explain what was happening with the science and math so instead of spending nearly three hundred pages confused and lost, I spent three hundred pages almost grasping the concepts. This fault is fully my own. I suspect that this metaphor heavy approach turns off the specialists while making the book more approachable for the general audience.

I did come close to gaining practical applications from reading this book. For instance one chapter is dedicated to the cycles of sleep. I have a very dear friend who suffers from some level of insomnia and as I read this chapter I kept coming this close to having a practical idea from the ideas presented in the chapter, and yet it remained elusive. So, dear friend, you don't suffer quite the scientific inability I suffer from, should you have the time or inclination, you could borrow Sync from the library and see if you can figure it out for yourself.

The review is taken from my blog bibliophilebet.blogspot.com

Charlene says

I enjoyed this book every bit as much as Gleick's book on chaos. Strogatz is an excellent writer. Able to convey complex concepts of chaos and synchronicity to the general reader, this book is for anyone with interest in the topic. If you don't fully understand chaos from one perspective, don't worry. Strogatz provides many.

With discussions of his own work as well as the work of mentors, students, and others in the field, Strogatz addressed the broad application of sync in the world and universe. Skilled at capturing the various personalities of people he has worked with, Strogatz also included interesting stories about many researchers in the field as well as interesting stories about the inner workings of academia. With examples from biology (ie., neurons, heartbeat, and sleep/circadian rhythm), to physics and engineering (ie., metronomes, super conductors, power grids, and the bridge in London), to social connectedness (ie., 6 degrees of separation from Kevin Bacon/small world model), and the future of sync studies (consciousness, evolution, immune system, the universe as a computer, and more), there are many fun things to learn about. I was also happy to learn about the lesser known role of Stanley Milgram in uncovering the 6 degrees of separation principle.

Who knew what the study of fireflies would bring? Excellent book.
