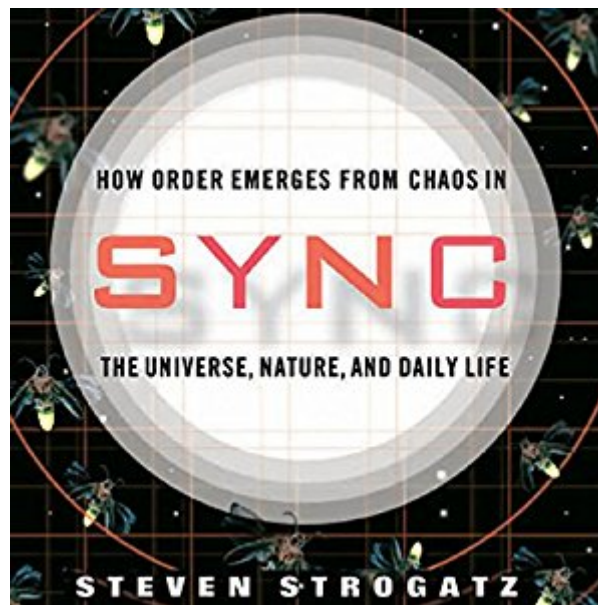




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# Sync: How Order Emerges From Chaos In The Universe, Nature, And Daily Life



## Synopsis

The tendency to synchronize may be the most mysterious and pervasive drive in all of nature. It has intrigued some of the most brilliant minds of the 20th century, including Albert Einstein, Richard Feynman, Norbert Wiener, Brian Josephson, and Arthur Winfree. At once elegant and riveting, *Sync* tells the story of the dawn of a new science. Steven Strogatz, a leading mathematician in the fields of chaos and complexity theory, explains how enormous systems can synchronize themselves, from the electrons in a superconductor to the pacemaker cells in our hearts. He shows that although these phenomena might seem unrelated on the surface, at a deeper level there is a connection, forged by the unifying power of mathematics.

## Book Information

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## Customer Reviews

This book formed the basis of a discussion group consisting of eight two-hour sessions. The members of our discussion group were mostly accomplished seniors retired from professions that required doctorate or masters degrees (e.g., aerospace engineers, doctors, physicists, mathematicians, technology professors, librarians, science teachers, etc.). About a third of us had no significant academic science backgrounds, just high intelligence, strong intellectual curiosity, and an abiding love for science. I must say that all of us without a strong academic science background found the class difficult. The book was always fascinating but also complex and at times quite difficult to follow. The hardcore scientists in the class were often very frustrated with the book's lack of supporting math and graphs. But I'm sure everyone in the class would agree that the book did provide a suitable framework for learning about

this topic in a mixed group from different academic backgrounds. Personally, coming from a humanities background, I found it extremely useful that our class contained a number of Ph.D. scientists who were able to explain some of the more difficult concepts in a manner that enhanced my understanding. I found the book enjoyable to read but definitely challenging. It opened my mind to a whole new world on nonlinear mathematics. I love to stretch my mind and this book and class did exactly that. Each of us had to do a forty-five-minute PowerPoint presentation for the rest of the class on a topic related to the book. I choose the synchronization found within the pacemaker cells of the heart. I was thrilled by this independent study topic and learned a great deal that was useful to me in my personal life. I would never have taken the time to explore in detail the detailed functioning of the human heart had it not been for the challenge of reading this book and taking this class. I am very grateful I did both.

I enjoyed Steven Strogatz's *Sync* very much. It is a rare book, more technical than a popular science piece yet written extremely well with the same craft of writing as a NY Times science piece -- unlike many textbooks -- and thus easy-to-read and imparting a lot of intuition and insight. Sadly, I suspect that the group that this type of book appeals to is fairly small -- that is, people who want something more technical than a pop science piece, yet do not really want to delve into the gory details in a textbook. That said, I enjoyed the book very much and highly recommend it. Some of the more interesting things in the book are the core discussion of how coupled oscillators tend to synchronize and, in general, how one gets the phenomena of synchronization. This is described for simple two body systems such as earth and moon (tidal locking), two nearby pendulums or two electric generators in parallel. The discussion of synchronization naturally leads to the topic of chaos and strange attractors. I found the discussion of the Lyapunov time and the degree of predictability particularly intuitive and enjoyable. There is also a lot in the book about non-physical applications, especially those related to biological systems. I found the discussion of sleep cycles interesting as I had never realized that our natural REM sleep cycle is synchronized to an internal clock that does not necessarily have to follow the 24-hour light/dark rhythm of the day. There also is a nice discussion of the history of how this was discovered and the practical ramification that it is often difficult for people to fall asleep right before their usual bedtime and sometimes after staying up very late they sleep much less than might be expected. Finally, there is a good overview of some of the interesting connected effects in social networks including the famous paper on small world networks, showing how having a few random links within a network dramatically cuts down the shortest path for communication. Overall I found this a very enjoyable book and I would highly

recommend it to anyone who falls in that niche between pop science and textbooks.

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.

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