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Steven **Strogatz** and his big discovery make for a great story, says Robert Matthews

**BYLINE:** Robert Matthews; Robert Matthews is science correspondent of The Sunday Telegraph

### **BODY:**

**Sync:** The emerging science of spontaneous order by Steven **Strogatz**, Hyperion, \$24.95, ISBN 0786868449

IN THE summer of 1982, while sitting around a fire at a campsite in Wisconsin, the bushes behind me began to pulse with light. It took a few moments for this townie to figure out the cause: fireflies, flashing in **sync** with each other as if wired together like Christmas lights. It has taken me a couple of decades to learn that I had also witnessed something that experts once insisted never occurred in the Western hemisphere, and that defied explanation.

Exactly how a swarm of dimwitted, leaderless fireflies get their act together in such spectacular fashion was only explained in the late 1980s. The implications of that explanation are far-reaching indeed. Once upon a time, the appearance of order out of nowhere was regarded as a sign of divine intervention, proof that some supreme intelligence had a hand on the cosmic tiller. In 1989, it was proved mathematically that any collection of oscillators whose frequency can respond to those around it will end up in synchrony. There's no need for any intelligence, collective or individual, let alone supreme. Order can emerge spontaneously out of disorder.

Discovery of this feature of nature must surely rank as one of the key insights of 20th-century science. It has opened up vast new fields of research, encompassing everything from the behaviour of electrons in metals to the sleep cycles of humans, the movement of planets to the rhythmic applause of opera-lovers.

As one of the two mathematicians who solved the mystery of fireflies, Steven Strogatz of Cornell University has remained at the forefront of

this revolution. Fortunately, he is also a gifted and inspiring communicator whose book, **Sync**, offers a real sense of what it's like to be at the beginning of Something Big.

As Strogatz makes clear, that Something Big has often been glimpsed by people who were too far ahead of the game to convince others of what they had seen. There was Norbert Wiener, the American mathematician who in the 1950s was telling everyone who would listen that the brain contains coupled oscillators to keep it in **sync**. It was a hunch broadly confirmed in the mid-1990s, 30 years after his death. There was Boris Belousov, the Soviet scientist who in the early 1950s found a chemical reaction producing rhythmic pulses of colour, a discovery dismissed as a delusion by the scientific journals.

Strogatz shows how these and many other apparently unconnected strands are all bound to the concept of order emerging from nowhere. The sheer range of phenomena involved is daunting, but Strogatz knows when to bring in a handy analogy or telling anecdote. Many are based on personal experience at the cutting edge of a new science, and are often refreshingly unorthodox: he has little time for self-appointed guardians of "proper science".

This no doubt explains his positive response to the apparently ludicrous proposal of Duncan Watts\*, one of his graduate students, who in 1996 suggested there might be hidden significance in the folklore that anyone is just six handshakes away from the President of the US. Watts and Strogatz went on to develop what is now called small-world theory, which is casting light on questions in fields ranging from economics to medicine.

Strogatz makes clear that these new discoveries are just the start, and that answers to many more questions may now have been brought within the reach of science. Some are profound: does synchrony within the brain hold the key to our sense of being conscious? Others are more down-to-earth: what is the best way of controlling traffic to prevent orderly flow turning into a jam?

Best of all, Strogatz leaves you eager to take part in what is clearly a scientific revolution -- if not to find the answers, then at least to have fun dreaming up the questions.