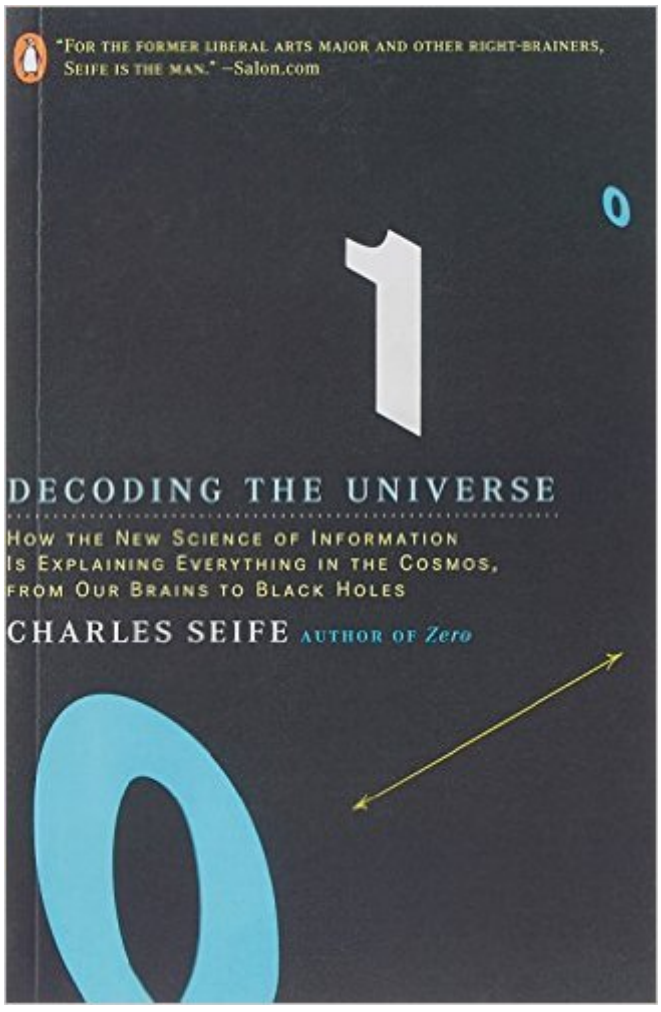
Decoding The Universe: How The New Science Of Information Is Explaining Everything In The Cosmos, From Our Brains To Black Holes



Synopsis

The author of Zero explains the scientific revolution that is transforming the way we understand our world Previously the domain of philosophers and linguists, information theory has now moved beyond the province of code breakers to become the crucial science of our time. In Decoding the Universe, Charles Seife draws on his gift for making cutting-edge science accessible to explain how this new tool is deciphering everything from the purpose of our DNA to the parallel universes of our Byzantine cosmos. The result is an exhilarating adventure that deftly combines cryptology, physics, biology, and mathematics to cast light on the new understanding of the laws that govern life and the universe.

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Customer Reviews

In reviews thus far of "Decoding the Universe," both formal and informal, there is a pattern of confusion and disorientation about the book’s real topic.Take Laura Miller’s review on Salon.com for example. Though it is largely a positive review, she introduces the book as a book on cosmology and compares it, as a few other reviewers have, to Seth Lloyd’s book on quantum computing, "Programming the Universe."Yes it is true, Charles Seife does write about the universe and he does have a chapter on quantum computing, but there is more to the book than multiverses and quantum computing.In fact, the very reason for this general sense of disorientation may be the real central concept of the book - Information. For most of us, information is, dates, faces, or names of places. It is an abstract concept. Contrast that to the concept of "Information" Seife introduces, a concept that

is physical, a concept that is probabilistic and one that governs the behaviors of atoms, black holes and all living beings.The word "Universe" in the title may have been a bit misleading, conjuring a, somewhere `out there' in a subatomic realm, far far away, image. The universe in Seife's title is not just about the universe out there in the dark sky, it really alludes to a `Universal Law' that applies to all things in our universe. Seife's book is really about an emerging law, that may well become, once all the debates come to an end, the most fundamental law of the universe."Information can neither be created nor destroyed.

Charles Seife has not been the first to proclaim that the most fundamental entity in the universe is "information". Physicist John Wheeler, David Bohm, and Tom Siegfried among others have held this view as well, but no other author I've read has gone to such lengths to establish this idea as an undeniable conclusion. In a consise staight-forward format, Siefe delves into biology, computer science, cosmology, Relativity, and quantum theory, to establish the notion that information and the second law of thermodynamics are intricately linked. And he does this without ever allowing the reader to become lost or confused. Information is always physical, whether it is marks on paper, holes in a punch card, atoms in an electo-magnetic state on a CD, photon polarization, or up/down spin on an electron. All information has a physical representation. And like any physical thing in our universe, it abides by the laws of nature, including the laws of thermodynamics and Relativity. Information, like energy, can neither be created nor destroyed. Infomation always moves toward the most probable state: maximum entropy. And no information can travel faster than the speed of light. The qubit, which is the quantum representation of the classical bit, abides by the laws of quantum physics, and despite the weird instantaneous quantum connection between particles in an entangled state demonstrated by Bell's theorem of inequality; the qubit does not violate faster-than-light communication. Oddly, the qubit does violate one tenant of Relativity--that no effect can precede its cause. It seems that the time-asymetrical qubit has no "before" or "after".

Seife begins with an introduction to information theory. He talks about redundancy and the relationship of entropy and probability to information. He recalls the work of Turing and Shannon. Then he reviews relativity as he leads us to quantum mechanics. He recalls the paradox of Schrodinger's cat and other peculiarities of QM.In general what he tries to explain to the general reader is how science is reinvestigating the fundamentals of physics from the standpoint of information theory, which apparently is going to replace physics. If Seife is correct, professors of physics are going to become professors of information theory, if that hasn't already happened. To

me replacing matter and energy with information is not helpful. But to physicists apparently it is not only helpful but something splendid.Consequently, there is a kind of "gee whiz" quality to Seife's expression, a quality that I found somewhat off-putting. Enthusiasm is fine and the ready acceptance of new ideas is agreeable when the ideas have experimental backing. For example he writes (speaking of a hypothetical creature inside the event horizon of a black hole): "...no matter how hard it tried, the creature would be utterly unable to send us a message...The pull of the black hole is too strong. Even if there were a huge population of these creatures swirling around the black hole, all screaming and signaling as loud as they possibly could, Earth would never receive a single bit or qubit of information about them." (pp. 242-243)Considering the physical conditions inside a black hole, the image of creatures "screaming and signaling" is absurd to say the least, and frankly ludicrous.