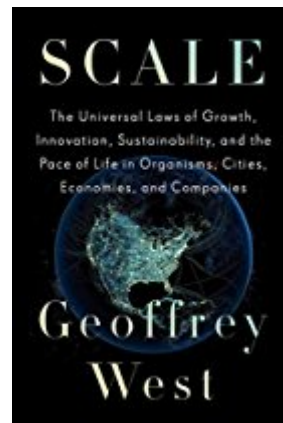


Reading Ebook Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West



From one of the most influential scientists of our time, a dazzling exploration of the hidden laws that govern the life cycle of everything from plants and animals to the cities we live in. Visionary physicist Geoffrey West is a pioneer in the field of complexity science, the science of emergent systems and networks. The term “complexity” can be misleading, however, because what makes West’s discoveries so beautiful is that he has found an underlying simplicity that unites the seemingly complex and diverse phenomena of living systems, including our bodies, our cities and our businesses. Fascinated by aging and mortality, West applied the rigor of a physicist to the biological question of why we live as long as we do and no longer. The result was astonishing, and changed science: West found that despite the riotous diversity in mammals, they are all, to a large degree, scaled versions of each other. If you know the size of a mammal, you can use scaling laws to learn everything from how much food it eats per day, what its heart-rate is, how long it will take to mature, its lifespan, and so on. Furthermore, the efficiency of the mammal’s circulatory systems scales up precisely based on weight: if you compare a mouse, a human and an elephant on a logarithmic graph, you find with every doubling of average weight, a species gets 25% more efficient—and lives 25% longer. Fundamentally, he has proven, the issue has to do with the fractal geometry of the networks that supply energy and remove waste from the organism’s body. West’s work has been game-changing for biologists, but then he made the even bolder move of exploring his work’s applicability. Cities, too, are constellations of networks and laws of scalability relate with eerie precision to them. Recently, West has applied his revolutionary work to the business world. This investigation has led to powerful insights into why some companies thrive while others fail. The implications of these discoveries are far-reaching, and are just beginning to be explored. Scale is a thrilling scientific adventure story about the elemental natural laws that bind us together in simple but profound ways. Through the brilliant mind of Geoffrey West, we can envision how cities, companies and biological life alike are dancing to the same simple, powerful tune.

Ebook Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Reading Book Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Reading Ebook Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Read Ebook [PDF] Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Pdf Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West

[Click here for Download Ebook Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West PDF Free](#)

[Click here Ebook Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West For DOWNLOAD](#)

Review "An enchanting intellectual odyssey...also a satisfying personal and professional memoir of a distinguished scientist whose life's work came to be preoccupied with finding ways to break down traditional boundaries between disciplines to solve the long-term global challenges of sustainability.... Mr. West manages to deliver a lot of theory and history accessibly and entertainingly... Provocative and fascinating."—The New York Times "Scale, a grand synthesis of topics [Geoffrey West] has studied for several decades, makes an important and eloquent case for the significance [of universal laws of size and growth] in an ecology of the natural and human world — and in understanding whether the two can fit together." —Nature "West's insightful analysis and astute observations patiently build an intellectual framework that is ultimately highly rewarding, offering a new perspective on the many scales with which nature and society challenge us...A fascinating journey." – Science Magazine "This is the sort of big-ideas book that comes along only every few years, the kind that changes the conversation in boardroom, common room and dining room....A book full of thrilling ideas." —The Sunday Times (London) "From a dean of complexity theory comes a sharp consideration of the pace and pattern of life in a universe of "complex adaptive systems" ...West's book is a succession of charts, graphs, and aha moments, all deeply learned but lightly worn. By the end of the book, readers will understand such oddments as why it is that the hearts of all animals, from mouse to elephant, beat roughly the same number of times across a lifespan and why the pace of life increases so markedly as the population grows (which explains why people walk faster, it turns out, in big cities than out in the countryside) ...Illuminating and entertaining—heady science written for a lay readership, bringing scaling theory and kindred ideas to a large audience."—Kirkus Reviews "I can think of no more exciting thinker in the world today than Geoffrey West. By bringing a physicist's razor-sharp mind to wonderfully surprising questions -- 'Why Aren't There Mammals the Size of Tiny Ants?' or 'Are Cities and Companies Just Very Large Organisms?' -- West forces us to see everything anew, from our own bodies to the mega-cities our species increasingly chooses to inhabit. Scale is a firework display of popular science." —Niall Ferguson, senior fellow, the Hoover Institution "This spectacular book on how logarithmic scaling governs everything is packed with news—from the self-similar dynamics of cells and ecosystems to exactly why companies always die and cities don't. I dog-eared and marked up damn near every page." —Stewart Brand, creator of the Whole Earth Catalog "Geoffrey West's Scale is filled with brilliant insights. He illuminates the laws of nature underlying everything from tiny organisms and humans to cities and companies, and provides a quantitative framework for decoding the deep complexity of our interconnected world. If you want to know why companies fail, how cities persist and what is needed to sustain our civilization in this era of rapid innovation, read this amazing book." —Marc Benioff, CEO of Salesforce "When Geoffrey West, a brilliant theoretical physicist, turned his lens to the study of life spans, biological systems or cities he stumbled onto a game-

changing universal insight about growth and sustainability. Scale is dazzling and provocative and West proves himself to be a compelling and entertaining writer—this is a book we will be talking about for a long time.” —Abraham Verghese, author of *Cutting for Stone* “If there were a Nobel Prize for transdisciplinary science Geoffrey West would have won it for the work covered in *Scale*. This is a book of great originality and deep importance, containing startling insights about topics as seemingly unrelated as aging and death, sleep, metabolism, cities, energy use, creativity, corporations, and even the sustainability of our existence. If you are curious about how the world really works, you must read this book.” —Bill Miller, Chairman, Emeritus, Sante Fe Institute

“Geoffrey West’s *Scale* is a revelation. Based on his path breaking theory and research on super-linear scaling, it provides powerful new insights into the basic scientific laws that power our modern society and economy, its startup companies, large corporations and cities. The book is a must read for CEOs, technologists, mayors, urban leaders and anyone who wants to understand the simple laws that shape the complex, self-organizing world in which we live.” —Richard Florida, author of *The Rise of the Creative Class* “This is an important and original book, of immense scope. Geoffrey West is a polymath, whose insights range over physics, biology and the social sciences. He shows that the sizes, shapes and lifetimes of living things - despite their amazing diversity -- display surprising correlations and patterns, and that these follow from basic physical principles. He then discovers, more surprisingly, the emergence of similar 'scaling laws' in human societies - in our cities, companies and social networks. These findings are presented in clear non-technical prose, enlivened by anecdotes which convey how these concepts arose, and thoughtful assessment of why they're important for those planning our future. This fascinating book deserves very wide readership.”

—Martin Rees, Astronomer Royal and author of *Just Six Numbers* “Each human should learn to read and write, to count, and for those who know how to count, scalability. Scaling is the most important yet most hidden and rarely discussed attribute—without understanding it one cannot possibly understand the world. This book will expand your thinking from three dimensions to four. Get two copies, just in case you lose one.” —Nassim Nicholas Taleb, author of *The Incerto* “An absolutely riveting read. Like the best detective story, West lays out the amazing challenge of understanding why animals, cities and companies all scale so uniformly and then skillfully lets us into the secrets that his detective work has uncovered. This book captures the spirit of science in the 21st century, revealing the deep connections not just across physics and biology but society and life. The book is a perfect balance between the big scientific story and West’s own personal narrative. We accompany the author on his quest to face up to his own mortality while at the same time being exposed to the theoretical discoveries that West has pioneered in his groundbreaking work.” —Marcus du Sautoy, Simonyi Professor for the Public Understanding of Science at Oxford University and author of *The Great Unknown* “It’s rare in the history of science that someone has a big, bold, beautiful, stunningly simple new idea that also turns out to be right. Geoffrey West had one. And *Scale* is its story.” —Steven Strogatz, Professor of Mathematics at Cornell University and author of *The Joy of X*

About the Author Geoffrey West is a theoretical physicist whose primary interests have been in fundamental questions in physics and biology. West is a Senior Fellow at Los Alamos National Laboratory and a distinguished professor at the Sante Fe Institute, where he served as the president from 2005-2009. In 2006 he was named to Time’s list of “The 100 Most Influential People in the World.”

Customer Reviews Most helpful customer reviews 151 of 162 people found the following review helpful. Disappointing book from an author who is capable of much better By Aaron C. Brown I had high hopes for this book, because the author is a great researcher and lecturer. However this book does not reflect his usual high standard. The beginning is terrible. He shows four graphs to illustrate scaling relationships, none of which have intelligible scales. I received an advance uncorrected copy, so perhaps some of the issues will be corrected in the final version, but the flaws run deeper than typographic. All the charts have log-log scales, although they are labeled in three different formats--scientific notation, exponent only or integer. There's an old saying that everything looks linear in

log-log plots. The reason that even a very large deviation in ratio of vertical to horizontal variable will look small if the range of the vertical variable is large. For example, the graph of "number of patents" versus "population" shows ratios that range from about 5 patents per capita to 200. No one would say that illustrates some universal law is in operation. But the vertical scale runs from population of 10,000 to 3.2 billion, 4.5 orders of magnitude, and that dwarfs the variation in patents per capita so things look linear. Standard statistical tests do not show linearity. Another problem with this chart is there is no explanation of how either variable is defined. You can't talk about scale in isolation from what is being measured. It's true there is a citation to the original work (although not a very helpful one). But it turns out that does not support the linearity the author of book claims, the whole point of the chart is to show that larger cities have more patents per capita than smaller ones, and says explicitly that the relation is non-linear. So the chart in the book is not only misleading by construction, it conveys the wrong idea. Another chart shows number of heartbeats per lifetime of "animals" versus weight. It looks constant, because the range seems to be about 30 million to 150 million, but the vertical scale runs from 100 to one trillion. "Animals" turns out to be a few selected mammals (whales are listed twice with different values). If you go to the paper, the author emphasizes that the interest is in the deviations from the typical relation shown by the animals on the chart; the chart only shows the typical animals. So far from a universal constant in nature, we find that a subset of mammals happen to have values within a factor of five, with other mammals and non-mammals outside that range, but missing from the chart even though the vertical axis is scaled to accommodate them. A better chart shows metabolic rate versus weight (here labeled "mass" despite being the same scale as the previous graph). This includes selected mammals and birds, and does illustrate rough linearity in log-log space. But here the main interest is in the slope of the line rather than the linearity. Metabolic rate increases not linearly with mass but at about the $3/4$ or perhaps $2/3$ power. This is key, because a lot of things also go up with powers of mass and people disagree on which ones of them are important for setting the metabolic rate. Finally, there is a chart purporting to show that net income and assets of companies are linear in log-log space with number of employees. This is clearly nonsense. Technology companies often have hundreds of thousands of dollars of net income per employee, and few assets, while retailers have an order of magnitude lower profits per employee but much higher assets. There are companies that own and lease things with huge assets and few employees, and service companies that own nothing but a few desks and computers with many employees. It turns out if you read the notes at the back of the book that the 22 points are actually averages of over 30,000 companies (by the way, page, chapter and figure numbers are wrong in the notes, but I assume this will be corrected before publication). So all the chart tells us is when you average over large numbers of companies of different types but similar size, you get similar relations of employees to income and assets as the average for large numbers of companies of a different size. It's not just the charts. Also in the first few pages, the author is hyperventilating about the "exponential rate of urbanization" that has increased the proportion of US residents who live in cities from 4% 200 years ago to 80% today and is an "impending tsunami with the potential to overwhelm us." A few seconds reflection shows the absurdity of that. If the urbanization rate is exponential, and has increased by a factor of 20 in 200 years, then in 15 years we'll be at 100% and the "tsunami" will stall. Now I know most people think "exponential" means fast, but most theoretical physicists, and certainly the author, know better. It just means that the rate of increase is proportional to the level. Nothing in the physical universe is exponential and fast. Things can start out exponential, like a fire that spreads faster the larger it grows. But that fire eventually uses up available fuel and oxygen and goes out. Urbanization in the US since 1790 fits a near perfect Gompertz trend with an asymptote at about 83% (that doesn't mean I predict urbanization will stabilize at 83%, drawing curves from the past is a dangerous way to predict the future, but at least a curve that fits the data is better than one that is clearly inconsistent with the data). Gompertz trends frequently give reasonable fits to data, exponential curves never do for very long. Another wildly false scare sentence is, "It is only relatively recently that we have become conscious of global warming, long-term environmental changes, limitations on

energy, water, and other resources, health and pollution issues, stability of financial markets, and so on." Take those one at a time. Global warming started in the mid-1970s, before that the Earth was cooling (you could push it back to the 1950s, but the 1950s were cooler than the 1940s; note that I'm not saying that greenhouse emissions were not affecting the global temperature before 1970, just that the Earth was not warming overall). It was not only noticed immediately, before clear statistical evidence of the trend emerged, it had been predicted long before. People have always been aware of "limitations on energy, water and other resources," and our supply of resources is far greater than at any time in the past. Health? People didn't know about sickness and death until recently? Pollution? The ancient Romans griped and sued about *gravioris caeli* and *infamis aer*, and Seneca wrote "No sooner had I left behind the oppressive atmosphere of. . .[Rome] and that reek of smoking cookers which pour out, along with clouds of ashes, all the poisonous fumes they've accumulated in their interiors whenever they're started up, that I noticed the change in my condition." Pollution has been a major political issue in Europe for nearly 1,000 years. People have known about instability in financial markets as long as there have been financial markets, and every expansion of markets since has been accompanied by periods of instability and crisis. After all this, only my respect for the author kept me going. The book gets quite a bit better when it leaves off the foolishness of the beginning and discusses specific topics with precision and insight. Nevertheless, I was overall disappointed by the book. It is repetitious and bloated. It tries to cover too many topics and relate them all to each other, often in strained ways. It mixes solid research with press release studies and outdated speculations. The notes are not as helpful as they should be, few of them have any explanation, many are just names of authors or books with no clue about how to find the specific support for the cited claim. There is not a clear distinction between patterns that occur for mathematical reasons--things like Fibonacci numbers, inverse square laws, Gompertz trends, fractal scaling and power laws--versus mathematical patterns that result from top down constraints. There is a lot of first-rate material as well, but it's not packaged well. Overall, I would recommend this book to people who are well versed in these subjects, with the patience to wade through an overlong and repetitious book for the good parts. The author is the undeniable world expert on some of these things, and they are very important things to understand. Readers who are new to these ideas are likely to be misinformed, although probably entertained. Readers who are not patient should look for a better exposition. 0 of 0 people found the following review helpful. This book is an explanation of a scaling concept that ... By KsBuyer This book is an explanation of a scaling concept that I have never seen described. I am not a scientist or a mathematician and the concept fascinated me because it introduced me to perspectives I had never explored. 0 of 0 people found the following review helpful. Overwhelming for a lay person By Rene It's going to be with me for a long time. Very interesting window into a new way of thinking. See all 52 customer reviews...

Reading Book Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Book Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Read Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Read Ebook [PDF] Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West ,Read Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies By Geoffrey West