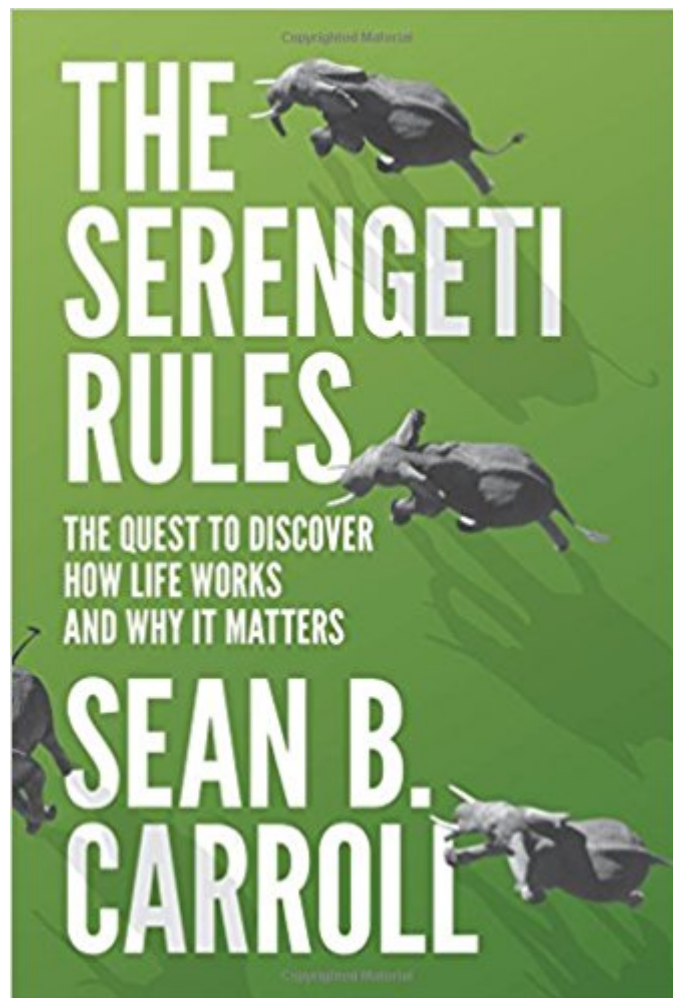




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# The Serengeti Rules: The Quest To Discover How Life Works And Why It Matters



## Synopsis

How does life work? How does nature produce the right numbers of zebras and lions on the African savanna, or fish in the ocean? How do our bodies produce the right numbers of cells in our organs and bloodstream? In *The Serengeti Rules*, award-winning biologist and author Sean Carroll tells the stories of the pioneering scientists who sought the answers to such simple yet profoundly important questions, and shows how their discoveries matter for our health and the health of the planet we depend upon. One of the most important revelations about the natural world is that everything is regulated—there are rules that regulate the amount of every molecule in our bodies and rules that govern the numbers of every animal and plant in the wild. And the most surprising revelation about the rules that regulate life at such different scales is that they are remarkably similar—there is a common underlying logic of life. Carroll recounts how our deep knowledge of the rules and logic of the human body has spurred the advent of revolutionary life-saving medicines, and makes the compelling case that it is now time to use the Serengeti Rules to heal our ailing planet. A bold and inspiring synthesis by one of our most accomplished biologists and gifted storytellers, *The Serengeti Rules* is the first book to illuminate how life works at vastly different scales. Read it and you will never look at the world the same way again.

## Book Information

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## Customer Reviews

One of Nature.com's Top 20 Books for 2016 One of Financial Times (FT.com) Best

Science Books of 2016" In *The Serengeti Rules*, the author goes from *E. coli* to elephants to lay out the basic rules that shape so much of what's around us and inside us."--Brian Switek, *Wall Street Journal*" In this remarkably engaging book, Carroll . . . persuasively argues that life at all levels of complexity is self-regulated, from the inner workings of cells to the larger relationships governing the Serengeti ecosystem. . . . Carroll superbly animates biological principles while providing important insights."--*Publishers Weekly*" *The Serengeti Rules* is one of the best biology books for general readers I've ever encountered. It should be required reading for every college student, regardless of major."--Andrew H. Knoll, Harvard University" A compelling read filled with big, bold ideas."--*Nature*" A thought-provoking challenge to complacency."--*Kirkus*" Carroll's book is fantastic, a success story in going from the specific to the general. It helps that Carroll is a gifted writer, captivating and thoughtful, and highly respectful of the reader. Carroll brings in the history of thought and research in the relevant areas of physiology, ecology etc. His messages are framed in the larger context of the Earth's overall health and important environmental issues. He links the subject matter to key central themes in biological theory (such as natural selection and evolution). And this is all done very well. You've seen the synthetic overviews of life and evolution framed in chaos theory, complexity theory, even quantum physics. This is better. This is a book to give to your favorite biology teacher (high school or college), and that teacher will take from it examples, connections, lessons, ways of telling, that will enrich their teaching immeasurably."--Greg Laden, *ScienceBlog's Greg Laden*" [A]s a subject for popular science, regulation seems to fail the thrill test; genetics and neuroscience appear more alluring. Now Sean B. Carroll. . . . Has risen to the challenge with this wonderful book about the natural control of numbers in living systems. Carroll is one of the top storytellers in contemporary science, as his previous writings about evolutionary biology have shown. Here he uses his narrative skills to take us on a scientific journey through time and space--making his case through the work of researchers around the world who have built up rules of life over the past century. . . . [The Serengeti Rules] is wholeheartedly recommended for its entertaining view of biology from an original perspective."--Clive Cookson, *Financial Times*" [A] deep journey into the rules of life on Earth. . . . By introducing us to the great pioneers of molecular biology, like Jacques Monod (enzyme regulation), Akira Endo (lovastatin developer) and Janet Rowley (cancer and inheritance of genetic diseases), Carroll sets the reader up with a strong foundation in the natural processes that go on within our own bodies, and describes how breakthroughs happen, such as the discovery of 'repressors' and 'suppressors,' (which act, not by 'doing things,' but by preventing things), and double-negative regulatory logic. We also learn what happens when these mechanisms fail."--Cathy Taibbi,

Examiner.com"Carroll is both a distinguished scientist. . . and one of our great science writers. . . .

[The Serengeti Rules] is a visionary book, which celebrates the new wisdom and the men and women who have brought the vision to pass."--Guardian"Sean Carroll's new book, with his thesis that everything is regulated backed by stories of discovery and inquiry, will enhance the way I teach biology. I am convinced that The Serengeti Rules should be required reading for students in all fields of science, but especially those pursuing careers in biology education."--Paul K.

Strode,American Biology Teacher"This book offers hope that we can make a difference, that we can follow those rules, and that things can get better on our planet, our home. It is well written, meticulously researched, and easy to read. I also learned more about the serendipitous nature of scientific discovery. I thoroughly enjoyed this book and highly recommend it to both teachers and students."--Cheryl Hollinger, American Biology Teacher"This book was easy to read and gave many great examples of the resiliency of nature.'--National Science Teachers Association

Recommends"For biologists, Carroll's book successfully conveys a powerful message: although biology is infinitely complex and diverse, simple sets of rules of regulation that apply across scales, from molecules to the entire planet's ecosystem, can and have been identified. They are also remarkably easy to explain, as shown by the many beautiful examples described in the book. So perhaps, next time a physicist or mathematician views biological research as lacking fundamental theoretical underpinning, a glimpse into Carroll's book . . . might help them reconsider their arguments. The Serengeti Rules is a great read."--Pavel Tomancak, Cell

Sean B. Carroll's new book The Serengeti Rules is a passionate telling of the story of the precarious and hard-fought balance that is the very precondition of health--both at the level of individual organisms and at the level of ecosystems. . . . The book is informative, well-written, and persuasive. . . . The Serengeti Rules is an optimistic book."--Alva Noë, NPR.org's 13.7 blog"The Serengeti Rules should be widely read."--Neil Paterson, Dundee University Review of the Arts"[A] triumphant account of how

physiology and ecology turned out to share some of the same mathematics."--Simon Ings, New Scientist"Scientific processes are explained clearly, and overall, it is delightful reading, helped along by many interesting anecdotes. . . . Nonscientists often are more aware of how things work in the human body than in ecosystems, which makes this book an excellent introduction to the macroworld, but surely young scientists will appreciate it as well."--Marco Ferrante, Conservation Biology

Sean Carroll, a distinguished, erudite, and literate developmental biologist, has written a book about biological principles. Namely, the principles that control the behavior of every cell in our bodies, that determine how we, as individual organisms, respond to the outside world, and the principles that determine how ecosystems, large and small, respond to being perturbed. . . . If you

read *The Serengeti Rules*, you will be better equipped to understand both the frailty and the resilience of the planet we share."--Bernard Wood, *Evolutionary Studies in Imaginative Culture*

"A master storyteller, Carroll explores the unity of biology from the molecular level to the Serengeti, the rules that regulate life, and the consequences when regulation breaks down. A fascinating journey from beginning to end, this book will educate and entertain readers at all levels and leave them with a better understanding of how the biosphere works."--Simon Levin, Princeton University, author of *Fragile Dominion: Complexity and the Commons*"*The Serengeti Rules* is a superb journey of a book written by a scientist of the first rank. Unfolding seamlessly from molecule to ecosystem, it explains with authority and grace why modern biology is central not just to human life but to that of the planet itself."--Edward O. Wilson, Harvard University"In *The Serengeti Rules*, Carroll has crafted a work of epic sweep."--Neil Shubin, author of *Your Inner Fish: A Journey into the 3.5-Billion-Year History of the Human Body*"Original, provocative, and beautifully crafted, Carroll's book provides a glimpse into the deeper laws of biology that govern the earth."--Siddhartha Mukherjee, author of *The Emperor of All Maladies: A Biography of Cancer*"This is a rattling good read by one of the leading scientists of our time. *The Serengeti Rules* made me think differently about what we biologists do. This is a book that needs to be shouted from the rooftops."--Andrew F. Read, Pennsylvania State University"Masterful and compelling. *The Serengeti Rules* is a significant contribution, one that will be welcomed by professional biologists and a wide range of lay readers."--Harry W. Greene, author of *Tracks and Shadows: Field Biology as Art*

As usual Carroll came up with a compelling book. Anyone interested in ecology will be provided with much to consider from *Serengeti Rules*. What he provides the reader with is how a food chain works. He describes not simply from the land animal perspective but also from several aspects of science and how an ecosystem works in all of the life sciences. This molecular biologist took his family to Africa where they explored the Serengeti and he developed an explanation for how systems keep in balance. He made his *“Serengeti Rules”* after examining how biological systems at several levels, consistently obey those rules. He did so by selecting several historical biological events and combining them with his own studies and the Africa trip, created a very readable and more importantly, plausible explanation. Ultimately the book is a combination of science (occasionally pretty deep for those without the academic background), history of science and what he discovered in Africa. He knows how to write a book, this being the third that I have read and never once disappointed. His ultimate point is that we are all in this

together. By *we* I mean all things with carbon in them. Gainsayers as he notes, suggest *So what? We win, they lose. That is how nature works.* when a species becomes endangered or worse. That is simplistic but more importantly just wrong. Ecosystems are important for everything that exists within them as there is symbioses amongst them even if it seems too obscure. An occurrence with one piece of biota impacts another that will impact another and so on and in the end, will impact all. Carroll makes this his point. He wrote about historical scientific events, some fairly distant in the past and some more recent. They included studies on high blood pressure, post-traumatic stress syndrome from World War II and advances in finding a cure for CML Leukemia with the understanding of the Philadelphia Chromosome. Not only were these studies significant but the characters involved scientific icons as a result. Elton, Monod, Cannon are only a few of the names of people who studied their problem by looking at the many events that could be impacting that problem. They looked at issues like leukemia as being an imbalance in the systems that impacted the problem they were trying to resolve. The solutions they came up with all reflected how one thing impacted another thing which impacted another thing. They found imbalances. Then he discussed some important concepts at the more macro level found in places like the Serengeti. One is what is called *Trophic Cascade*. This concept describes the effects on food chains when a species is delimited or expired. It is referred to as *bottom up* when a seemingly insignificant part of a food chain is gone and how that changes which organism eats another. It can impact negatively, a large beast because its element of the chain is disrupted. It is called top down when a large predator is limited or gone from an environment changing the structure of the food chain below it. Within the notion of trophic cascade comes the term *Keystone Species*. Those are the ones that impact all others in very significant ways. In our popular lore and well intentioned pleas for action, this species tends to be either big or cute. In fact a Keystone species may be a large predator that when endangered changes the food chain by introducing more food for another species with sometimes dramatic effects on the ecosystem. If a major predator is missing then another specie grows in numbers and they impact the ecosystem by what they eat which may ultimately be the ruin of the whole ecosystem. Like the trophic cascade, keystone species could be seemingly small ones in an ecosystem but their demise could work the same way because ultimately they are affecting the entire food chain as well. I came to understand this many years while working in my vegetable garden. My thoughts were much coarser than Carroll's presentation but as I introduced lady bugs to rid my garden of aphids I began to think that something else will take its

place. No aphids could well lead to an invasion of some insect or perhaps disease that the aphids kept in check. I did not know what they might be but did imagine that there are always tradeoffs in an ecosystem. He ended the book by describing the restoration of a massive park in Angola that has had more strife than could be expected over the last 30 years. Angola is a war torn nation with an assumed to be Marxist government and a civil war with its rebels. The latter group had pretty much destroyed Gorongosa, a park named for its mountain. While the levels of destruction were massive, you will only get the details when you read the book. What Carroll describes as the best solution to revitalizing this treasure is to “Focus on law enforcement, not reintroduction.” This is a sentiment dear to me. I find it perplexing and annoying when suggestions are made of re-introducing species to an ecosystem that they have been extinguished from. It is an idea that is too late. The trophic cascade has already changed the environment to the extent that it is impractical to reintroduce a species. Even worse is the call for introducing hybrid species via cloning. I think that is more of a nutty idea than anything else. The problems that Africa faces with their ecosystems is often a result of poachers who glean something valuable like ivory by killing elephants or some sort of idiocy such as sexual enhancers only found in a species that may be a keystone one. This book is rife with interesting and informative details. A part of me wants to reveal the six Serengeti Rules and to go into more detail about the historical stories of scientific innovation but I would be a spoiler. I would either provide a potential reader with enough information to not read the book or would be wrecking all the good parts. It is a book that I would recommend reading so that one could better understand homeostasis or balance in ecosystems. That can make anyone a better steward of our land.

Being raised in small County in Nevada that had the basic economy of mining, farming and ranching. The big enemy of the farmers and ranchers of course is the BLM (Bureau of Land Management) which put unnecessary restrictions and rules along with fees on them. The miners got along with BLM since they didn't regulate mining. Even today, there is a trial going on about ranchers that wouldn't pay their grazing fees and brought in some hired guns, well maybe not hired, but they brought their guns to defend the ranchers from the evil BLM. Just a little history back ground. Now let get with review of this Book. The ranchers and farmers blamed the cougars, coyotes, bobcats and even the eagles of killing their cattle, pigs, sheep, chickens and other livestock. So, they went to war on them and even put a cash reward for the capture or killing of these predators. This was back in the 1950s and 60s. Well in about in the latter part of that period, they had a bumper crop of jack

and cotton tail rabbits. They were everywhere, in the fields, in towns, in the school yard along the roadway in fact you couldn't drive a dozen miles without running over a dozen rabbits. The BLM tried to warn them about killing the predators, but what does BLM know about farming and ranching. In fact, they (farmers and ranchers) blamed BLM for the rabbit population explosion. Well, the rabbits almost completely stripped farmers and rancher's fields of crops used to feed their families and livestock and they had get their feed and groceries from town which cost them dearly and the price of maintaining their livestock went so high, they had sell them at a loss rather than a profit. In fact, it gets worse, as a young man and avid rabbit hunter, I would go with my friends to pick off the rabbits with our .22 rifles which farmers and ranchers just loved us for it. As we approached a field, most rabbits would scatter, but some did not, in fact they ran toward us. I thought oh no were being attacked, but that was not the case. These rabbits were infested with parasites and worms so badly that they could not see, hear nor smell. Disease, parasites along with worms do infest herbivores, but these are usually taken by predators thereby keeping the herbivores population healthy from these diseases and parasites. Well, the farmers and ranchers decided they better listen to the Evil BLM and see if they could get a handle on the rabbit population. Well, this listening finally got through to the farmers and ranchers that a healthy ecology had to have both predators and prey to protect the environment of animals to plants to microorganisms that was established hundreds of million years ago. Also, farmers and ranchers started to send the offspring to colleges and get a proper education on managing the land along with ranches and farms. Today, the only item left by the Evil BLM is the Fees which the trial is still ongoing. This book should be read by people who interest in farming and ranching along with those interest in ecology.

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