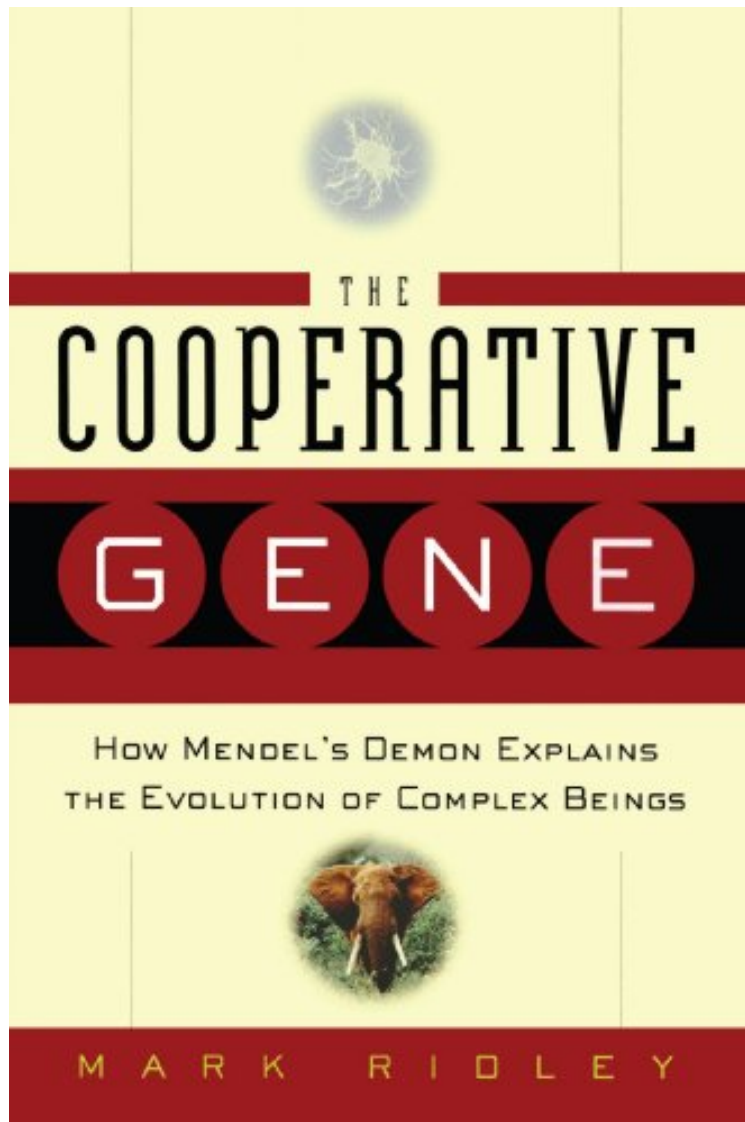


## Cooperative Gene

Mark Ridley

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#3927876 in Books Free Press 2008-10-02 2008-10-02Original language:EnglishPDF # 1 9.00 x .80 x 6.00l, 1.15 #File Name: 1439144044336 pages | File size: 58.Mb

**Mark Ridley : Cooperative Gene** before purchasing it in order to gage whether or not it would be worth my time, and all praised Cooperative Gene:

0 of 0 people found the following review helpful. The Muddled Mind - Bad Science Writing Lacking In Clarity and CoherenceBy Allan M. LeesScience books need to be clearly written and set out a compelling argument. This book, of which the title is actually misleading and clearly only adopted in order to seem like a rebuttal of a far better book (Dawkins' The Selfish Gene), is neither well written nor does it contain a compelling argument. Instead we get a

mlange of half-digested concepts, many of which have already fallen by the wayside, presented poorly and leading to a distinctly under-compelling conclusion. In short, this isn't worth your time. 2 of 3 people found the following review helpful. Happy but Hoping for More

By Paul R. Adams  
Ridley's book is a rare combination : a popular book by a professional biologist with novel, important and well-founded ideas. Unfortunately he does not quite succeed in convincing me, even though I started out with a similar outlook. But there's a lot to enjoy, admire and learn from nevertheless: Ridley knows his stuff, has a lively and amusing style, and thinks clearly. His central idea is that sexual reproduction allows the evolution of much larger genomes, encoding much more complex organisms, than asexual reproduction, because it allows Darwinian evolution to continue even when the single-base copying error rate is much larger than the reciprocal of the genome length. Evolution is thought to be possible if organisms reproduce only asexually if they copy the nucleotide bases comprising their DNA with an error rate less than the reciprocal of the DNA length - a result which was first clearly stated by Manfred Eigen. As Ridley explains, this is because mistakes will accumulate over many generations unless at least half the offspring have error-free DNA. There is an important, though probably quantitatively minor caveat: the mistakes must be deleterious (and the extent to which they are deleterious affects the error threshold above which Darwinian evolution fails). Obviously, this idea is not easy to convey, even though it makes intuitive sense, and unsurprisingly Ridley does not quite succeed in explaining it. But it's such an important idea, and Ridley does quite well, that I have to give him a high grade - an A-. I feel he could have shown one of Eigen's classic graphs, even if it would require some hand-holding. He does not really address the dependence of this issue on the rate of environmental change, though he hints at it. In an unchanging environment, one expects the mutation rate to be minimized, perhaps to the level that is physically attainable. Indeed, prokaryotes seem to operate in this regime (possibly because they reproduce rapidly, so their environment appears to change slowly). He then points out that complex organisms do not seem to conform to this theory, and he (correctly in my view) surmises that this is precisely why they are complex: they have astonishingly large genomes, and yet copy their DNA no more accurately than the asexually reproducing prokaryotes. He then suggests that complex organisms can do this (i.e. defy Eigen) because they reproduce sexually. Indeed, he argues that the life that is familiar to us, and in some ways "real life", is only possible because of sex. In a nut-shell, sex IS life! I think this idea is correct, but it is rather surprising, and Ridley does not quite convince. It's well known (except fortunately by creationists) that it's very difficult to explain how sex persists despite its twofold cost. Ridley believes (again I think correctly) that there is a huge, outweighing, advantage to sex: it allows an apparently impossibly high mutation rate because it greatly increases the power of natural selection. In particular, he favors Kondrashov's idea that sex allows one to more efficiently remove deleterious mutations, because it brings them together in the same, sacrificial, offspring genome. To make this idea work, one has to assume that bad mutations interact synergistically, and one probably also has to assume that the environment is changing rapidly in time and/or space (an aspect that Ridley does not address well). Ridley mentions fleetingly Hamilton's parasite sex theory, and disappointingly doesn't explain why he does not like it, or why it is not just a special case of the Kondrashov theory (i.e. the environment changes rapidly because parasites rapidly co-evolve, a la Red Queen). I believe there is no clear consensus amongst biologists on these important issues, and Ridley does not quite convey the complexities and confusions of these debates - perhaps wisely. But nevertheless I wish he had tackled them more head-on. The next part of the book is very good, and here he seems much more at home. In particular his account of the difficulty of preventing selfish genes from subverting the new opportunities offered by Mendelian sex is superb. But while fascinating this is not really the nub of the matter. In summary, this is one of the best accounts anywhere of crucial aspects of Darwinian evolution that are often concealed by the experts (perhaps because they do not want to admit that the whole structure is surprisingly rickety). I believe that despite appearances the structure is indeed sound, but even this admirable book does not provide completely convincing evidence. 18 of 22 people found the following review helpful. Nice Book with a Misleading Title

By Herbert Gintis  
The title of this book is clearly a reference to Richard Dawkins' famous "The Selfish Gene." One of the most amazing developments in evolutionary and developmental biology in the past couple of decades is that evolution is just as much about cooperation as it is about competition. In particular, several authors, including Maynard Smith and Szathmary, Michod, and Keller (see his Princeton U Press collection) have analyzed the development of multicellular organisms in a conflict/cooperation framework. The result is quite unfavorable to Dawkins' approach. This book mentions the problem, but disposes of it so rapidly that virtually nothing of interest can possibly get through to the reader. Rather, this book is about the problem of replication error in copying dna. Ridley argues that the level of complexity of organisms is limited by their ability to sustain highly accurate copying, and that humans are about at the limit of this ability. This is an interesting argument, but to my mind it isn't earth-shattering and it doesn't require a whole book to tell. Of course, you will learn a lot of biology in the telling (if you didn't know it already), and Ridley is a very good writer. Ridley flirts with eugenics in the policy section of the book, lamenting that modern wealth, technology, and medicine allows lots of defective genes to proliferate in society, but he does not recommend doing anything about it---such as forcing people to abort imperfect fetuses. He argues that cloning shouldn't replace sexual reproduction because, whatever the value of sexual reproduction (Ridley is agnostic, but favor Kondrashov's model), it's clearly valuable. But we don't need a book or copying accuracy of dna to tell us that. In sum, nothing monumental here, but very nice if you want to learn a little

about how modern biologists think, and what they think about.

Why isn't all life pond-scum? Why are there multimillion-celled, long-lived monsters like us, built from tens of thousands of cooperating genes? Mark Ridley presents a new explanation of how complex large life forms like ourselves came to exist, showing that the answer to the greatest mystery of evolution for modern science is not the selfish gene; it is the cooperative gene. In this thought-provoking book, Ridley breaks down how two major biological hurdles had to be overcome in order to allow living complexity to evolve: the proliferation of genes and gene-selfishness. Because complex life has more genes than simple life, the increase in gene numbers poses a particular problem for complex beings. The more genes, the more chance for copying error; it is far easier to make a mistake copying the Bible than it is copying an advertising slogan. To add to the difficulty, Darwin's concept of natural selection encourages genes that look out for themselves, selfish genes that could easily evolve to sabotage the development of complex life forms. By retracing the history of life on our planet -- from the initial wobbly, replicating molecules, through microbes, worms, and flies, and on to humans -- Ridley reveals how life evolved as a series of steps to manage error and to coerce genes to cooperate within each body. Like a benign and unseen hand -- what Ridley calls "Mendel's Demon" -- the combination of these strategies enacts Austrian monk Gregor Mendel's fundamental laws of inheritance. This demon offers startling new perspectives on issues from curing AIDS, the origins of sex and gender, and cloning, to the genetics of angels. Indeed, if we are ever to understand the biology of other planets, we will need more than Darwin; we will need to understand how Mendel's Demon made the cooperative gene into the fundamental element of life. What does the cooperative gene tell us about our future? With genetic technology burgeoning around the world, we must ask whether life will evolve to be even more complex than we already are. Human beings, Ridley concludes, may be near the limit of the possible, at least for earthly genetic mechanisms. But in the future, new genetic and reproductive biosystems could allow our descendants to increase their gene numbers and therefore their complexity. This process, he speculates, could lead to the evolution of life forms far stranger and more interesting than anything humanly discovered or imagined so far. Written with uncommon energy, force, and clarity, *The Cooperative Gene* is essential reading for anyone wishing to see behind the headlines of our genetic age. It is an eye-opening invitation to the biotech adventure humanity has already embarked upon.

.com *The Cooperative Gene* is about sex and how sex enabled complex life to arise. Mark Ridley, a researcher and author of many works including the textbook *Evolution*, contends that simple life is "easy." Simple life like bacteria evolved as soon as conditions on Earth permitted. But complex life--walking, flying, swimming, squawking organisms with differentiated tissues--was a huge step forward. It took billions of years for complex life (and sex) to appear. More than anything, organisms want to pass on their genes. Sex seems to defy natural selection in its ability to convince organisms to pass on only half their genes. Natural selection will favor "selfish" genes, ones that can beat the odds and get passed on. But if this happened all the time, complex life could not exist. So how does it? Enter what Ridley describes as "Mendel's demon," a system in which genes are passed on in a random fashion. Most important, the demon prevents selfish genes from sabotaging that randomness. Although *Gene* isn't a technical book, its ideas are complicated. Ridley's style is methodical, broken by the occasional dryly humorous aside. Evolutionary biologists and other assorted PhDs will no doubt be entertained. Popular-science buffs may find it slow going, but they will be rewarded by a thorough understanding of the topic. In his last two chapters, Ridley leaps further afield, exploring the influence of technology on human evolution and speculating how future science could change us. He also examines the idea of supercomplex organisms, beings that would tower over humans in complexity to the same degree that humans tower over bacteria. It's pure speculation but compelling nonetheless, worthy of its own book. --J. B. Peck

From Publishers Weekly

The field of genetics rarely makes for easy reading, but Ridley's anecdotal approach lightens the load. At times his writing conveys a sense of awe at the vast complexity of the universe, elevating his topic to appropriately sublime heights. His interest lies in the role that error has played in our four-trillion-year journey toward ever more complex forms, from single-celled eukaryotes to humans, and possibly beyond. Two kinds of genetic mistakes occur in reproduction, the author tells us, one accidental, the other intentional. The former results in copying errors similar to the way a simple message in a game of "telephone" can be drastically altered as it relays from player to player. The latter results from genes that harm the body by uncooperative and selfish acts. As Ridley, a biologist at Oxford University and a regular contributor to *Scientific American*, *Nature* and the *New York Times*, shows, both kinds of error threaten the existence of complex life, and sex provides the solution, by concentrating errors in particular offspring and leaving others virtually error-free. Perhaps not unexpectedly, though, sex poses problems of its own, because natural selection, if unchecked, would seem to favor the selfish gene, making the evolution of complex life impossible. The evolutionary balancing act is achieved through a manner of genetic inheritance first described by Gregor Mendel. The so-called Mendel's demon, a mechanism of inheritance with a random component, directs the laws of biology toward creativity rather than destruction. As the author puts it, "Somewhere between the bacteria and us perhaps at about the stage of simple worms God did have to start to play dice." Copyright 2001 Cahners Business Information, Inc. From *Scientific American* Ridley asks how living things

vastly more complex than the simple life-forms that first populated Earth can arise. His answer is that they require mechanisms to deal with mistakes in the copying of DNA and a means of taming "selfish genes that harm the body by uncooperative and subversive acts." The main solution to the copying problem is sexual reproduction; the means of taming selfish genes is Mendelian inheritance, which ensures "the probabilistic rather than certain inheritance of genes." Ridley (a biologist in the zoology department of the University of Oxford) invokes a hypothetical "Mendel's demon" as the enforcer of chance inheritance; the demon "stands over each gene in a parent and decides whether it will be inherited in the next generation, and which other genes it will be passed on with." And, having laid out his argument, he intriguingly explores the possibility that "superhuman life forms" may someday arise. Editors of Scientific American