Aging is a Group-Selected Adaptation: Theory, Evidence, and Medical Implications

Joshua Mitteldorf
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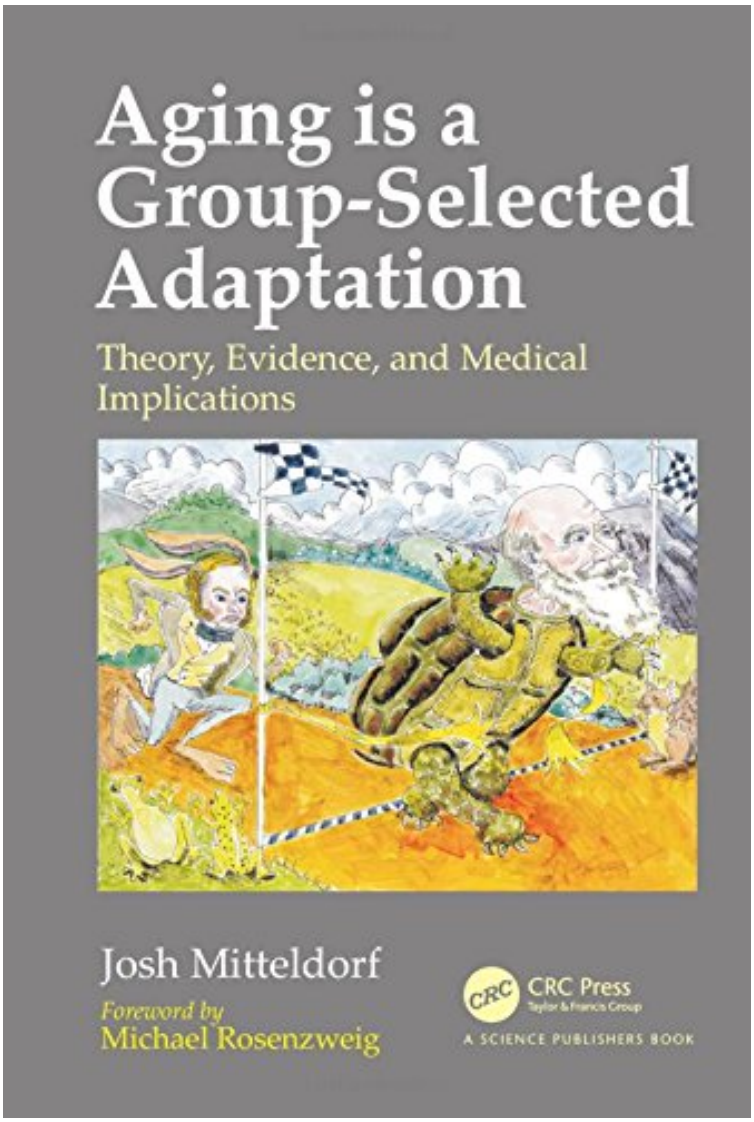

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Joshua Mitteldorf : Aging is a Group-Selected Adaptation: Theory, Evidence, and Medical Implications before purchasing it in order to gage whether or not it would be worth my time, and all praised Aging is a Group-Selected Adaptation: Theory, Evidence, and Medical Implications:

3 of 3 people found the following review helpful. provocativeBy Peter McCluskeyThis provocative book argues that our genes program us to age because aging provided important benefits.I'll refer here to antagonistic pleiotropy (AP)

and programmed aging (PA) as the two serious contending hypotheses of aging. (Mutation accumulation used to be a leading hypothesis, but it seems discredited now, due to the number of age-related deaths seen in a typical species, and due to evidence that aging is promoted by some ancient genes).Here's a dumbed down version of the debate:: Hamilton proved that all conceivable organisms age due to AP and/or mutation accumulation.: But the PA theories better predict how many die from aging, the effects of telomeres, calorie restriction, etc. Also, here's some organisms with zero or negative aging ...: A few anomalies aren't enough to overturn a well-established theory. The well-known PA theories are obviously wrong because selfish genes would outbreed the PA genes.: Here are some new versions which might explain how aging could enhance a species' fitness ...: I've read enough bad group-selection theories that I'm not going to waste my time with more of them.That kind of reaction from theorists might make sense if AP was well established. But AP seems to have been well established only in the Darwinian sense of being firmly entrenched in scientists' minds. It got entrenched mainly by being the least wrong of a flawed set of theories, combined with some poor communication between theorists and naturalists. Wikipedia has a surprisingly good [1] page on the evolution of aging that says: "Antagonistic pleiotropy is a prevailing theory today, but this is largely by default, and not because the theory has been well verified."When I first read about group selection, its leading advocates saw evolution as creating important spandrels. They complained about adaptationism. That led me to distrust them and suspect they were biased by a desire to deny that features they liked (e.g. altruism) were "merely" the result of a process as arbitrary and amoral as evolution.But now it seems like the opponents of group selection see spandrels, and the group selectionists promote adaptationism.I've previously seen decent arguments that group selection is real:- Richard Alexander pointed out (in The Biology of Moral Systems) that group selection seems to work if populations have attributes much like those of individuals.- Elliott Sober and David Sloan Wilson gave examples (in Unto Others: The Evolution and Psychology of Unselfish Behavior) of behavior which couldn't have evolved without group selection.- Joseph Henrich convinced me (in The Secret of Our Success: How Culture Is Driving Human Evolution, Domesticating Our Species, and Making Us Smarter) that group selection had important effects on human progress. He focused on cultural evolution, and implied that the effect on human genes was relatively unimportant. But his argument should lead us to expect real, although possibly minor, effects on human genes.Each time I saw one of those arguments, I updated a bit in favor of group selection. But I was still quite surprised by Mittledorf's claims about how important group selection has been. This suggests I haven't been updating enough, and that I need to feel more confused about the subject.Mittledorf suggests three fairly speculative ways in which group selection might contribute to aging:- The demographic hypothesis: populations boom during times of plenty, then die from famine. Outbreeding one's neighbors isn't very valuable if it wipes out the entire population.However, his first example of this seems weak: the Rocky Mountain locust is an example of an unusual extinction, but where's the evidence that would tell us what caused the extinction?It seems plausible that sizable populations occasionally go extinct from overpopulation followed by famine, but I'm unsettled by the shortage of good evidence.- The Black Queen model: aging helps to avoid infectious diseases via increased diversity and/or avoiding dangerous population densities (similar to the Red Queen hypothesis).- Evolvability: a faster turnover of individuals in a population enable that population to evolve faster. This seems like a real, but weak, source of fitness.The demographic hypothesis has some interesting implications for which species should show most age-related deaths. I'm disappointed that Mittledorf said little about that. Highly territorial species should show more aging. Species that don't kill their food source should show less aging (e.g. species that eat only fruit or nectar?). Species that depend on a single prey species should age more than omnivorous species. Prey tend to age faster than their predators, because the resulting ecosystem is more stable. I'd expect animals with much longer typical lifespans than their prey to show few age-related deaths, especially species with few predation-related deaths.Mittledorf has some quantitative models showing how the group selection might work. I see no easy way to evaluate their realism. He offers source code (in Pascal) for two relevant programs, but I don't have time to analyze them anytime soon.Comparing various hypotheses about aging is hard, because they only contradict each other when phrased in the form "X is the primary reason for aging". Nothing requires evolution to work in a simple enough way for any one simple hypothesis to be the main reason something evolved. AP is a real force. Nobody denies that. There are large disagreements about how important various effects are, but they often only imply weak differences in predicted observations.Many discussions of group selection have been politicized. Mittledorf occasionally sounds like a left-wing ideologue, but I found it fairly easy to ignore those parts.I expected widespread hostility to the book's ideas, but instead the reactions seem fairly mixed and weak.Aubrey de Grey has a paper responding to an earlier version of Mitteldorf's argument titled "Do we have genes that exist to hasten aging? New data, new arguments, but the answer is still no". But he mainly says that AP hasn't been disproved - something that can also be said of PA.I'm 75% confident that the standard explanations of aging are wrong, but I'm only 30% confident that Mitteldorf's explanations are more than half right.Mitteldorf also has a more popular book on this subject (Cracking the Aging Code). The technical book is readable enough that I'm not tempted to recommend reading a dumbed down version of it.Implications?It's tempting to conclude we can cure aging by altering the relevant clock(s). But Mitteldorf's ideas imply that we've evolved so that a simple mutation can't just turn off aging (species that found it easy to turn off aging would sometimes do so, then go extinct as a result). Instead, we should expect many small interventions, such as calorie restriction and lengthening

telomeres, to provide benefits that are small compared to a full cure for aging, yet large compared to standard approaches to age-related diseases.[1] - except for its inability to use the One True Spelling of "aging".2 of 2 people found the following review helpful. Moveover, selfish gene!By TumamocMost people may not be familiar with the term "Group Selection." As the book lucidly explains, it means Nature favoring attributes of life that preserve species. But for a century, evolutionists have taught that Nature favors only that which helps the individual. Mitteldorf corners this view and destroys it, not by ranting but by a 20-year old chain of scientific evidence that mows down idea after idea that has been advanced to explain how selfishness might be responsible for aging. To catch up, we biologists have a lot of work to do!Mitteldorf clearly sets out his arguments and evidence. He is not out to intimidate the reader nor look down his nose.Certainly the job is not complete. We have much to learn. But there was no hope of learning it with biased brains that failed to admit the possibility, no, the likelihood, that we need to make room for group selection in our world views.Mike RosenzweigU of AZ

Although books exist on the evolution of aging, this is the first book written from the perspective of again as an adaptive program. It offers an insight into the implications of research on aging genetics, The author proposes the Demographic Theory of Senescence, whereby aging has been affirmatively selected because it levels the death rate over time helping stabilize population dynamics and prevent extinctions.