# Genomes Decaying, but Darwin Always Gaining

said Richard Lenski, co-author of a 2017 paper. The phrase highlights persistent and misleading misunderstandings in evolutionary biology.

Darwinism is based on the idea of "survival of the fittest", but if fitness is defined solely in terms of reproductive success rather than complex capabilities, then "survival of the fittest" does not at all imply creatures would naturally evolve toward "extreme perfection and complication" (to quote Darwin). In fact, the 2017 paper, specifically said that as fitness gained by cells, the cells lost versatility. In other words, the cells lost complex capabilities that would have helped them thrive in wider spectrum of environmental conditions.

The definition of "fit" in the formal population genetic/evolutionary sense is at odds with "fit" in the engineering, medical, and common sense. The general public, the scientific community, general public, and seemingly many evolutionary biologists don't seem to appreciate this conflict of definitions.

Not only is there a conflict among definitions for the word "fit", but the evolutionary/population genetic sense is tautological and useless in establishing that Darwinian evolution actually works to evolve "Organs of Extreme Perfection and Complication" (*Origin*, VI). And if that were not enough, even with this useless and tautological definition, population geneticists realized to their horror that there is no guarantee this sort of fitness will ever maximize. And if only to make matters worse, they realized genomes could spiral into decay, and populations self-destruct into extinction.

Below is a collection of quotations by evolutionary biologists themselves that highlight the aforementioned problems. The quotations are in red and commentary in black.

In 1996 when H. Allen Orr criticized ultra-Darwinist Daniel Dennett, and by way of extension Orr criticized the flaws in Darwinism itself:

> Dennett is fond of speaking of selection as leading organisms through "Design Space": Selection "lifts" organisms along "ramps" of good Design. Although this imagery is often useful, it invites two subtle misconceptions about adaptation. The first is that natural selection cares about Design. In reality,

> selection "sees" only brute birth, death, and reproduction, and knows nothing of Design. Selection -- sheer, cold demographics -- is just as happy to lay waste to the kind of Design we associate with engineering as to build it. Consider the eyes of cave organisms who live in total darkness. If eyes are expensive to make, selection can wreck their exquisite engineering just as surely as it built it. An optic nerve with little or no eye is most assuredly *not* the sort of design one expects on an engineer's blueprint, but we find it in *Gammarus minus*. Whether or not this kind of evolution is common, it betrays the fundamental error in thinking of selection as trading in the currency of Design.

When Orr wrote this in 2002, it was not as evident then as it is now that this is sort of destructive evolution is very common, and it could in fact be that destructive evolution, rather than constructive evolution, is the dominant mode of evolution.

Rather than use the word "destructive" evolution, evolutionary biologists adopted the word "reductive" evolution to specifically describe reduction of genome size in microbes. However, this notion can be generalized to all sorts organisms beyond microbes.

A title of a paper by Wolf and Koonin's reads, "Genome reduction as the dominant mode of evolution." However, Koonin appeals to episodes in life's history where life had these furious bursts of innovation and complexification that have no adequate explanation, especially in light of the results of actual present-day experiments. Wolf and Koonin in their own words:

> **A common belief is that evolution generally proceeds towards greater complexity at both the organismal and the genomic level, numerous examples of reductive evolution of parasites and symbionts notwithstanding. However, recent evolutionary reconstructions challenge this notion.** Two notable examples are the reconstruction of the complex archaeal ancestor and the intron-rich ancestor of eukaryotes. In both cases, evolution in most of the lineages was apparently dominated by extensive loss of genes and introns, respectively. These and many other cases of reductive evolution are consistent with a general model composed of two distinct evolutionary phases: the short, explosive, innovation phase that leads to an abrupt increase in genome complexity, followed by a much longer reductive phase, which encompasses either a neutral ratchet of genetic material loss or adaptive genome streamlining. **Quantitatively, the evolution of genomes appears to be dominated by reduction and simplification**, punctuated by episodes of complexification.

The "abrupt increase in genome complexity" is in contrast to the typical mode of genome destruction. Darwinism cannot rigorously account for these apparent phases of gene loss and then bursts of complexification.

Michael Lynch said, "there are many more ways to disrupt rather than to improve genomic function". Let us call this *Lynch's Principle*. One could alternatively state Lynch's Principle as "many ways to break, but few ways to make."
Here is Lynch's Principle in context, with bolded portions:

> Within the field of population genetics, the phenomenon of mutational meltdown—in which a population may become extinct owing to the accumulation of deleterious mutations—has been well studied both theoretically and experimentally. The key to understanding this effect is a consideration of the efficacy of natural selection. Because **there are many more ways to disrupt rather than to improve genomic function, the vast majority of new fitness-impacting mutations are deleterious rather than beneficial**. Thus, if mutation rates are increased, the result is a disproportionate excess of variants that are detrimental to the organism. Because natural selection will not be able to purge this input of deleterious mutations if the mutational pressure is sufficiently large, these variants may remain in the population and even reach fixation. This deleterious load further restricts the ability of natural selection to purge additional variants, allowing more deleterious mutations to accumulate and fix, and so on—a snowball effect that can result in the eventual loss of the population (i.e., mutational meltdown).

Lynch unfortunately uses the words "beneficial" and "deleterious" which in the evolutionary sense does not necessarily correlate with complexity, since many "beneficial" mutations are in fact loss of complexity! Nevertheless, his statements are in the right direction, albeit missing the mark slightly.

Lynch's principle inspires an informal qualitative definition of complexity that defines complexity as "the number of ways a functional system can be broken." For example, a mouse trap has many fewer parts to achieve its operation vs. a space shuttle. As something is more complex, the number of ways a functional system can be broken increases. For example, we can objectively say a space shuttle is more complex than a paper airplane. Also a space shuttle has many more complex capabilities to enable it to be versatile in a wider variety of environments.

With this definition of complexity in mind, this question should be asked, "what real-time or historically tracked experiment or set of observations has demonstrated sustained increase of complexity in terms of major new gene families (not just homologs of pre-existing genes) and/or systems of novel complexity (not just homologs of a pre-existing system)?" The rarity or complete lack of such examples is in stark contrast to evolutionary biologists hyping misleading claims of "increased fitness gains", when in fact, they were more properly characterized as irreversible losses of complexity.

The rarity of complexity increasing changes is so acute, Sharon Molem wrote the New York Time best seller, "Survival of Sickest: Why We Need Disease". Molem writes of the abundance of the advantageous Darwinian traits of Tay-Sachs disease, sickle cell anemia, diabetes, obesity, etc.! Molem's book belies the problem of finding truly "beneficial" mutations that are improvements in complexity, and the specter that Darwinian evolution facilitates genomic destruction rather than its construction over time.

How then can Darwinian selection be asserted to create complexity if it is not correlated with increase in complexity? Only by faith, and certainly not by any direct evidence. The case for Darwinian mechanisms creating large scale accumulation of complexity has been made through obfuscation and equivocation of the term "fitness", rather than actual experiment and theory. The Lenski 2017 unwittingly highlights the illegitimate equivocation by evolutionary biologists of the idea of "beneficial mutation" with "complexity-increasing mutations".

Lenski developed and promoted a computational model called Avida that purports to show how Darwinian process can accumulate complexity over time. Unfortunately for Lenski, his own promotion of the imaginary Avida world was contradicted by his own experiments! Worse for Lenski, other experiments and direct observations in the field have shown that his Avida program was rooted in wishful thinking, not observable events.

Even to evolutionary biologists, it is not clear what fitness is. Andreas Wagner, 2005. Robustness and Evolvability in Living Systems. New Jersey: Princeton University Press.

> **However, fitness is hard to define rigorously and even more difficult to measure.** . . An examination of fitness and its robustness alone would thus not yield much insight into the opening questions. Instead, it is necessary to

> analyze, on all levels of organization, the systems that constitute an organism, and that sustain its life. I define such systems loosely as assemblies of parts that carry out well-defined biological functions.

Ironically, Wagner's phrase "systems loosely as assemblies of parts that carry out well-defined biological functions" sounds remarkably similar to Michael Behe's definition of Irreducible Complexity: "A single system composed of several well-matched, interacting parts that contribute to the basic function of the system" (Behe, 1996, *Darwin's Black Box*, pgs. 39–40).

Richard Lewontin, 2003. "Four Complications in Understanding the Evolutionary Process". In: *Santa Fe Institute* Bulletin 18.1:

> "it is not entirely clear what fitness is"

Lewontin's above quote in context shows just how bad the confusion is:

> The difficulties of the concept of fitness are, unfortunately, much deeper than the problem of frequency and density dependence. The problem is that **it is not entirely clear what fitness is**. Darwin took the metaphorical sense of fitness literally. The natural properties of different types resulted in their differential "fit" into the environment in which they lived. The better the fit to the environment the more likely they were to survive and the greater their rate of reproduction. This differential rate of reproduction would then result in a change of abundance of the different types.
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> In modern evolutionary theory, however, "fitness" is no longer a characterization of the relation of the organism to the environment that leads to reproductive consequences, but is meant to be a quantitative expression of the differential reproductive schedules themselves…
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> How, then, are we to assign relative fitnesses of types based solely on their properties of reproduction? But if we cannot do that, what does it mean to say that a type with one set of natural properties is more reproductively fit than another? This problem has led some theorists to equate fitness with outcome.
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> If a type increases in a population then it is, by definition, more fit. But this suffers from two difficulties. First, it does not distinguish random changes in frequencies in finite populations from changes that are a consequence of

> different biological properties. Finally, it destroys any use of differential fitness as an explanation of change. It simply affirms that types change in frequency. But we already knew that.

RH Brady pointed out:

> the operational forms of the concepts of adaptation and fitness turn out to be too indeterminate to be seriously tested

and Brady points out further absurdities in evolutionary biology:

> Take, for example, the satirical German folk-saying which claims that: 'If the cock crows on the manure pile, it will rain — or it won't.' What does this really say about experience? Will anything be different if the cock crows? The two sides of the proposition are distinct, but the second part does not specify any observations, for it is simply too broad. One can neither apply nor test the statement, for it fails to specify any particular result.

To elaborate the problem more precisely, if I said, one could win or one could lose in the game of dice, that would be a statement that is not experimentally testable, as every outcome is accounted for. However, if one said, there is a 49.3% chance of winning at a game of dice, that is a testable hypothesis that can be experimentally demonstrated by a large number of trials in accordance with the law of large numbers.

By way of extension, if one said, Darwinian mechanisms can increase or decrease complexity, it is not an experimentally testable claim. However, if one said, the odds of 20 necessary simultaneous mutations creating a new feature arising by mutation and selection over several generations and with a certain population structure and mutation rate, then the claim is testable. Otherwise it is a fairly useless scientific claim.

RH Brady points out that even eminent scientists like Waddington could not grasp the absurdity of the definition of fitness in evolutionary biology:

> the fittest individuals in a population (defined as **those which leave the most offspring) will leave the most offspring**.

Taking the bolded portion without the parentheses, we get:

> **those which leave the most offspring will leave the most offspring**

Such is the emptiness of the concept of fitness in evolutionary biology! A more meaningful phrase would be, "a creature with the ability to swim, can move and gather food in acquatic environments." We can then assess in mechanical terms if a creature like a penguin or polar bear can swim vs. a creature like a rose bush. Thus, the engineering notion of "fit" is more in line with intuition than the tautologous definition in evolutionary biology.

RH Brady quotes Lewontin on the problem of making evolutionary definitions of fitness that can't possibly be tested experimentally:

> For what good is a theory that is guaranteed by its internal logical structure to agree with all conceivable observations, irrespective of the real structure of the world. If scientists are going to use logically unbeatable theories about the world, they might as well give up natural science and take up religion.

Furthermore, even with the vacuous definition of fitness in evolutionary biology, Patrick Moran and others realized fitness may not even ever maximize for a population but gets stuck and prevent further advance. This fact was highlighted in the 2017 paper, "It was a beautiful theory in deed: The Rise, Fall, and Circulation of Fitness Maximization," by Grodwahl.

> This ambition [to demonstrate fitness always maximizes] came to a halt in the context of the influential objections made by the Australian mathematician Patrick Moran in 1963.

Felsenstein comments on the consequences of Patrick Moran's work in Felsenstein's book, *Theoretical Evolutionary Genetics* 2017:

> it is easy to show that not only can recombination lead to a continual decrease of mean fitness during the course of evolution, but it leads to an equilibrium state which has lowered mean fitness.

But as early as 1989, Joseph Felsenstein in 1989 realized the futility of proving evolutionary fitness inevitably maximizes in light of Moran's work.

From Flesenstein, 1989, "Mathematics vs. Evolution." Science 246 (4932): 941-942:

> …with enough information, population genetics can be extraordinarily powerful. It is when we must generalize over a wide range of possible models that the intractability of the mathematics becomes infuriating…
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> …Sewall Wright and R. A. Fisher derived results that seemed to imply that natural selection would act so as to maximize the mean relative fitness of members of a population.
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> **It did not take a new generation of theoreticians long to discover holes in this – systems of linked genes can evolve steadily away from the maximum mean fitness**. Even Fisher's and Wright's one-locus equations turn out to be approximations, sometimes bad ones. If we could discover what quantity was being maximized, it might yield some insight into how the details of the genetic system compromise adaptation. After 20 years of effort there has been no great progress on the central problem – the genetic system is not designed for the convenience of mathematical theorists. All theory has done is disprove postulated generalizations. The mathematical tools at hand have not revolutionized our understanding of the evolutionary process.
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> ……**many evolutionists will fail to find the clear and simple messages that population genetics theory once seemed to promise**…