No solution to evolution's greatest puzzle

Arrival of the Fittest: Solving Evolution's Greatest Puzzle
Andreas Wagner
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John Woodmorappe

The author is identified as a Professor of the Institute of Evolutionary Biology and Environmental Studies at the University of Zurich, Switzerland. He lectures worldwide and is a fellow of the AAAS (American Association for the Advancement of Science).

This book is a curious mixture of biological facts that have been recently found and those that had been a mainstay of evolutionary thinking for decades. In this review, I present general principles and do not get into technical details of such things as the capabilities of the RNA molecule that the author has investigated. This I leave to specialists. Owing to the fact that author Andreas Wagner gives many analogies to make his points, I also do so in this review.

Evolutionary selectionism is not enough

Survival of the fittest should not be confused with arrival of the fittest. Wagner acknowledges that the standard way of evolutionary thinking is inadequate,

> "Referring to random change, recited like a mantra since Darwin's time, as a source of all innovation is about as helpful as Anaximander's argument that humans originate inside fish. It sweeps our ignorance under the rug by giving it a different name. This doesn't mean that mutations don't matter, or that natural selection isn't absolutely necessary. But given the staggering odds, selection is not enough. We need a principle that accelerates innovation" (p. 33).

However, Andreas Wagner is inconsistent in his thinking. Later in the book, he falls back on the selectionist view of the evolutionary origin of eyes, where natural selection is supposed to effectively do magic on minor, step-by-step improvements in eyesight.

Origin of life

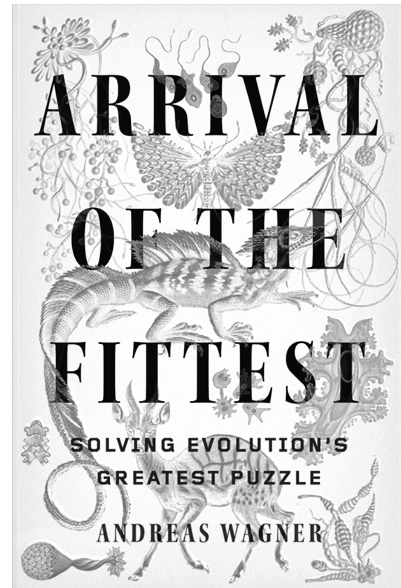
The author dusts off the ideas of Manfried Eigen on hypercycles. He admits, however, that Eigen's paradox still holds.

> "Faithful replication needs long and complex molecules, but long molecules require faithful replication. To this day, nature has not shown us an exit from this labyrinth, but as we shall see in Chapter 6, a principle of innovability found in today's life provides a clue" (p. 46).

(Does it? Innovability exists in today's organisms. It begs the question how this innovability originated!)

Wagner speculates (and I emphasize the term 'speculates') that life originated through a network of autocatalytic chemicals. Chemicals do not make direct copies of themselves. However, a network of chemicals is imagined to cause their indirect 'reproduction'.

Incredibly, Wagner cites certain membranes that divide into smaller droplets when shaken, and states that this shows that membrane droplets can divide like living cells (p. 58)!



This reminds me of the silly argument, made decades ago, by an evolutionist debating Dr Duane T. Gish. The evolutionist actually claimed that protein microspheres were, in a sense, a primitive form of life. The immortal Duane T. Gish replied that the evolutionist's assertion was "absurd in the extreme". Any resemblance to life is completely superficial. (I once told Dr Gish, and he agreed, that it was like saying that a girl's plastic doll is, in a sense, a human infant.) The droplets divide because of simple surface tension, and the contents of the original droplets are divided between the new ones. There is nothing paralleling even the simplest binary fission in bacteria; where DNA is reproduced, the two halves are moved to opposite ends, and a new cell wall grows in the middle to separate the two cell halves into new cells.

In the end, Wagner tacitly admits that evolutionary origin-of-life scenarios are completely speculative, if not wishful thinking (see figure 1). He comments,

> "We do not know—yet—whether the citric acid cycle is the grandfather of all metabolic activity. Nor do we know whether a metabolism of any sort came before RNA replicators. We do know, however, that the very

first thing in the planet's history that deserves to be called alive needed an autocatalytic mechanism to still its hunger" (pp. 54–55).

"We do not yet know how life evolved all this complexity from its simple origins, and we may never know for sure. The oldest single-celled fossils are as complex as modern cells, and their ancestors are shrouded in darkness" (p. 63).

Innovation in bacteria?

Wagner cites, as examples of evolutionary innovations, bacteria with never-before-seen biochemical capabilities. He cites *Sphingobium chlorophenolicum*, a bacterium that can live entirely on pentachlorophenol (PCP, C_6Cl_5OH), an antifouling chemical first made by humans in the 1930s. He also mentions bacteria that cannot only break down, but feed on, antibiotics, including man-made ones not found in nature.

The ability of an enzyme, or chain of enzymes, to break down a man-made substance is not in itself remarkable. By analogy, there is nothing remarkable about a dog able to chew a hole through a piece of man-made material (e.g. plastic). The same biomechanical actions of the tooth bite directed against natural targets (flesh or bone) can be directed against plastic. In like manner, the same enzymes that attack natural complex molecules by finding a 'kink' in them can find the same 'kink' in man-made complex molecules, effecting their breakdown.

The papers that Andreas Wagner cites[1] do not, on close examination, support evolutionary novelty. It turns out that he has essentially hyped a process that has nothing to do with the emergence of evolutionary novelty. Nothing new has been generated. Consider, by analogy, what happens when a player wins a card game. It occurs because he got a winning combination of cards. Notice what is and what is not novel. The combination is novel. None of the cards themselves are novel. All the cards in the game had been there from the very beginning of the game. No new cards, let alone new suites of cards, had been created de novo just before or during the game.

So it is with the bacteria, including those that broke down recently originated man-made chemicals. The bacterium that first broke down the chemicals did so because it had gotten the 'winning combination' of genes through horizontal gene transfer from other bacteria, and from recombination. All of the genes ('cards') had been preexistent in the population of bacteria all along, e.g. tetrachlorohydroquinone dehalogenase, which degrades one of the breakdown products of PCP. No new genetic information ('cards') had been created to eventually cause the 'winning combination' to come up in bacterium.

Clearly, the foregoing examples of bacterial action are not evidence for any form of "arrival of the fittest" evolutionary novelty. All of the genes in the bacterial population could have existed since Special Creation, and no evolutionary explanation is necessary to account for the abilities of the bacteria to break down unusual chemicals.

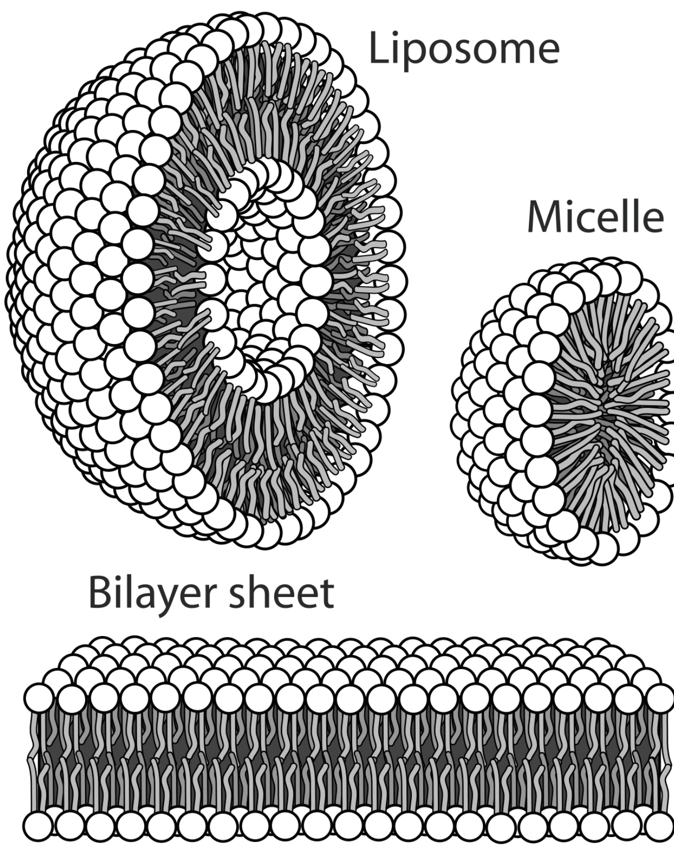


Figure 1. All evolutionistic origin-of-life scenarios are completely speculative. A believed key step for abiogenesis—life arising from non-living matter—is the formation of lipids into 'protocell' membranes.

Hox genes—multiple simultaneous changes

The author dusts off the example of Hox genes in order to illustrate how mutations can simultaneously affect many different components of the organism. However, it appears that this is a revival of the old 'hopeful monster' scenario. It certainly does not follow that simultaneous changes have anything to do, at least necessarily, with the arrival of a more-fit organism. If anything, they would guarantee the appearance of at least one severely deleterious trait, causing the immediate elimination of the organism by natural selection. The same considerations would, of course, apply to any other putative mechanism that could cause simultaneous changes in the organism.

Let us, by analogy, consider the fact that extreme cold will change many of the mechanical and structural components of a car simultaneously. What does this do? Owing to the different degrees of contraction of various alloys, the mechanical and structural components are altered in numerous subtle ways. The hood fits a little less snuggly. A slight gap appears in the tailpipe. The door is a little too tight. The fluids are more viscous, so it is harder for the engine to turn over, and it is harder for the transmission to rotate the axles because of the gummy transmission oil. Owing to the congealing of power steering fluid, it is now harder for the driver to turn the steering wheel. The pistons are slightly looser. The battery puts out less power. And so on.

Of course, one could think of other processes (such as extreme heating, or a major collision) that would affect many systems of the car simultaneously. Regardless of the mechanism, one could think of myriads upon myriads of ways that a car and its components could be simultaneously altered, but it does not follow that any single one of these simultaneous changes would necessarily produce a better-functioning car, let alone a qualitatively different novel machine. Once again, we have no arrival of the fitter.

Evo-devo

The author touches on evolutionary developmental biology, which is commonly called 'evo-devo'. He suggests that it offers fantastic insights into how genes cooperate with each other like orchestra musicians, but that it offers no solid evidence for evolution. He quips,

> "So far, though, these insights have not yet added up to a theory rivaling the modern synthesis. And only theory can turn a heap of facts into a tower of knowledge. The culprit is once again the enormous phenotypic complexity of whole organisms. Even today, we struggle to fully understand the phenotype of even the simplest organism, and hundreds of thousands of biologists laboring over many decades have still not fully understood how genes shape this phenotype" (pp. 22–23).

RNA innovation?

Wagner, in common with many other evolutionists, posits a scenario wherein RNA was the original building block of life. According to this thinking, the DNA molecule was a later evolutionary add-on, and the currently observed co-dependence of RNA and DNA was a still more recent evolutionary development.

Consistent with the foregoing conjecture, Wagner has experimented with the RNA molecule. He claimed to have found that the RNA molecule is much more versatile than previously suspected. It can change from a 'splitter' to a 'fuser' function. The unexpected multiplicity of functions of RNA, in and of itself, tends to support the RNA-first scenario. Does it necessarily, even leaving aside the huge problems of forming a very unstable molecule like RNA in a primordial soup?[2]

Let us consider the analogy of the car thief doing his work on an automobile. He finds that he can hot-wire the car and drive it away. Should the evolutionist get excited about the fact that there are two completely different ways (at least) to start the car and drive away with it? Furthermore, that car's specific keys can be bypassed in order to start and operate the car. Better still, no key of *any* kind is needed to start and run the car. Would the evolutionist think that keys were a later evolutionary add-on to the car? Should the evolutionist engage in triumphalism, proclaiming that no intelligent designer is needed to account for the existence of cars?

Assumed evolutionary innovation

At times, the author's reasoning degenerates into the same old evolutionary thinking: A living thing exists, therefore it evolved. Instead of showing examples of (alleged) evolutionary novelty, Wagner merely *assumes* that evolutionary novelty had occurred in the past. Thus, when he discusses the varied biochemical cold adaptations of Arctic and Antarctic fish, he just infers that an evolutionary innovative process has produced these adaptations sometime in the past. However, it's not a great feat to be an antifreeze protein—any junk sequence will do as long as it has one end to bond to water molecules and another to repel other water molecules, preventing them condensing together into ice crystals.[3] Moreover, he tacitly admits that his reasoning is based on conjecture as he falls back on the customary evolutionary storytelling,

> "The ability to protect against freezing may not have arisen abruptly but gradually, where some amino acid changes increased a protein's ability to protect against freezing to a small extent, until today's antifreeze proteins had formed" (p. 238).

And they lived happily ever after.

Another outright example of *post-hoc* evolutionary reasoning involves the presentation of a cladogram that shows the amino acid differences in the hemoglobin of the human, chimpanzee, mouse, and chicken (p. 121). Once again, this does not demonstrate evolutionary innovation or the arrival of the fittest. It *assumes* evolutionary innovation and *assumes* the arrival of the fittest as a long-ago evolutionary outcome.

As mentioned earlier, the author brings up the evolution of the eye. Instead of offering anything new, he only repeats the *ad hoc* time-worn tale of the eye evolving in gradual steps, although he stresses that this in no way takes away from his ideas.

Globin oxygen-binding variants: novelty or semantics?

The author dwells on the many different forms of globins among living things. All of them can bind oxygen (figure 2). There are globins not only in vertebrates, but also in worms, mollusks, insects, sea stars, and plants. Obviously, any consideration of their diversity, as coming from a common ancestor, already assumes that evolution has taken place.

Even if one accepts evolution as the explanation for all living things, one must ask what actually constitutes an innovation. Wagner realizes this, and it is obvious that a diagnosis of novelty at least partly rests upon a prior belief in the evolutionary process. Thus, he writes,

> "A subtle philosophical question is what constitutes different solutions to the same problem. A chemist may argue that two proteins different in their amino acid sequence but cleaving a small molecule with the same reaction mechanisms are similar solutions, whereas two proteins that use a different reaction mechanism are different solutions. From an evolutionary perspective, however, it is sensible to view all genotypes that serve the same function as different solutions to the same problem, because each of these phenotypes can, in principle, be discovered independently from other genotypes" (p. 240).

Modified functions do not imply a non-intelligent cause

The author presents a number of examples of the varieties of proteins that work. He does the same for other biological systems. All this he takes as proof that there are many solutions to a biological program and that, by implication, no intelligent designer is needed. Is this so?

Since Wagner likes analogies, permit me to make this one. Consider the gas-powered lawnmower. It could be modified in hundreds of ways (and at least thousands of changes in assortment) and still function. We could, for instance, vary the lengths of the electrical wiring, gasoline-feed tubing, lawnmower handle, etc. In addition, we could use wires composed of many different metals and their alloys, and do the same with the gas-feed tubing with regards to the many different plastics or rubber-based compounds that it could be made of. We could use many different compositions of string, and non-string materials, to serve as the cord for the pull-starter.

Let us keep going. We could substitute an astonishing variety of petroleum-based fuels for the gasoline. We could, to a degree, change the shape of the housing that contains the motor. We could substitute one style of sparkplug for other styles. We could, to a degree, change the size of the wheels, and completely replace the existing wheels with wheels variously made of solid rubber, hollow (pneumatic) rubber, wood, ceramic, differing metals and alloys of them, etc. We could replace the wheels entirely with caterpillar threads. And so on, ad infinitum.

However, none of these changes, nor still others that could be imagined,

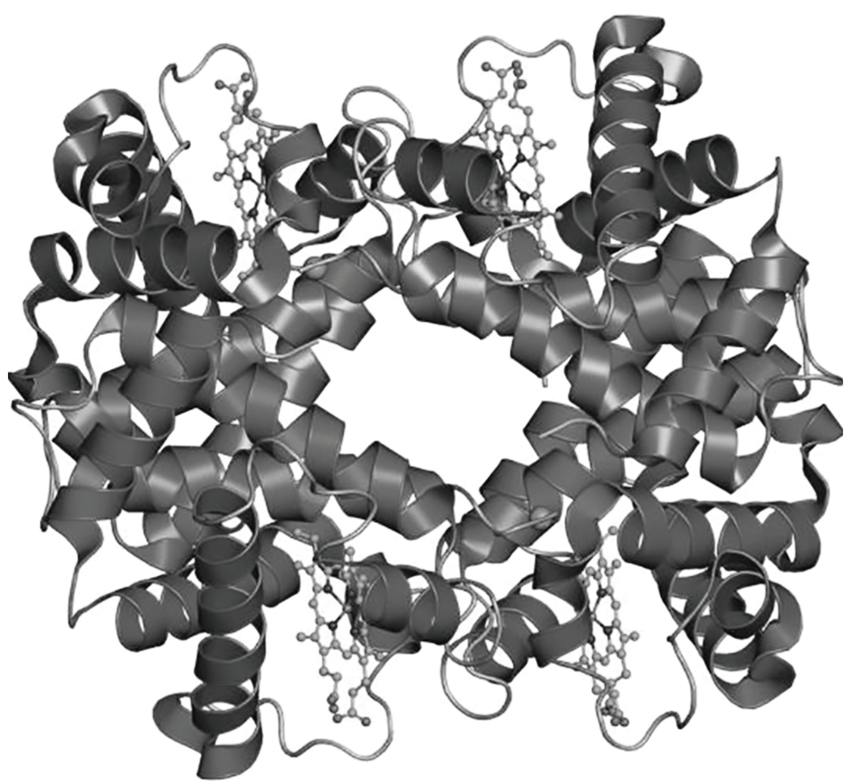


Figure 2. A visual representation of just some of the complexities of the oxygen-binding globin molecule.

would have any bearing in terms of an explanation of how the lawnmower could have originated from a spontaneous, non-intelligent cause. In like manner, the great variety of functional metabolic pathways, protein modifications, etc., do not, at least by themselves, explain how these systems could have originated from a spontaneous, non-intelligent evolutionary cause.

As a matter of fact, Wagner tacitly admits that, even within the context of evolutionary theory, there is no straightforward way of assessing the role of presumed evolutionary innovations,

> "While life has discovered some innovations more than once, it may have discovered others only once, but the genotypes encoding them may have diversified later beyond recognition. In some systems, for example proteins where current genotypes are extremely diverse, it is difficult to distinguish multiple independent origins from a single origin followed by diversification" (p. 254).

Are loss-of-information mutations innovations?

In common with many evolutionists, Wagner tries to pass off a loss of function, which happens to enhance the survivorship of the organism in some specialized environment, as a beneficial mutation. For instance, he cites the tighter binding of oxygen to the hemoglobin, and how this helps the human body function at high altitudes, where oxygen pressure is low.

As another example, he brings up that the sickle cell is normally less efficient in oxygen transport than a normal one, but the sickle cell trait is beneficial in that it enhances its bearer's fitness in a high-malaria environment. But it does this by a 'scorched earth' tactic: the malarial parasite causes the red blood cell to 'sickle', and the spleen destroys this cell with the parasite inside. Thus the host is still down by one red blood cell.

What does all this mean? Let us return to the lawnmower analogy. Accidental damage (a 'mutation') occurs to a wire, and the electricity in it now arcs, producing some illumination. The 'mutation' is beneficial, as the low-level illumination it produces now allows for the lawn mowing to start slightly earlier, at dawn, and to end slightly later, at dusk. Of course, the 'mutation' may also qualify as a loss-of-function one, as the competition for voltage may now cause the spark plug to misfire, making the overall lawn mowing task less, not more, efficient. However, the earlier start and end times may still create a net increase in the 'fitness' of the lawnmower. Using a little evolutionary imagination (and I emphasize the word 'imagination'), one could envision additional 'beneficial mutations' that correct the spark-plug problem and further enhance the illumination, allowing the lawn mowing to start even earlier and end even later.

Is the foregoing electric-arcing 'mutation' profound, or is it trivial? Does it, in any case, have any bearing on how the lawnmower supposedly originated by spontaneous, non-intelligent processes? Hardly. Neither do individual instances of arguably beneficial mutations.

Genotype networks—neutral theory expanded

Evolutionists always tell us that complex structures in living things do not arrive in one step—like jumping to the top of the mountain from its base. (This follows the 'Climbing Mount Improbable' analogy of Richard Dawkins.[4]) Instead, minor beneficial mutations are preserved by natural selection. This selectionist process occurs over and over again—like climbing a mountain step by step until one arrives at the summit.

By contrast, the neutral theory of evolution posits that evolution is mainly driven by neutral mutations. A whole series of mutations accumulate that are neither fixed nor eliminated by natural selection. Eventually, a new neutral mutation interacts with a pre-existing neutral mutation, and the joint effect of their expression increases the fitness of the organism that bears them. Natural selection then favours the preservation of the combination of mutants.

The problem with the neutral theory is obvious. Because a fortuitous confluence of mutations is needed to benefit the organism, this process returns the situation to the jumping-to-the-top-of-themountain-in-one-step.

Andreas Wagner revives the decades-old neutral theory of evolution with a twist. He focuses on genotype networks. This is supposed the increase the probability of the emergence of a beneficial fortuitous combination of neutral mutations getting juxtaposed with each other, thereby increasing the fitness of the organism. Does it? To expand the analogy of jumping from the base to the summit of the mountain in one step, there are now many mountains that are candidates for jumping, and not just one. The person can now jump from the base to the summit, in one step, of *any* mountain on planet Earth, and this will count as a success. Is this, however, really appreciably more likely to happen than jumping from the base to the summit on one specified mountain on Earth?

Let us now pursue the analogy used by Wagner. He says that it is not hard for one needle to find another needle in the haystack, because the haystack has many needles. What if, notwithstanding this fact, it is still vanishingly probable for one needle to encounter another needle?

The author's abysmal ignorance

The author's conception of the scientific creationist position is beyond pathetic. He actually states (p. 9) that creationists believe that the world was created on a Saturday night in October of 4004 BC. For his elementary information, no modern mainstream creationist believes that!

It gets even better, saying Noah's Ark had saved more than a million species [no doubt including insects and fish], but had forgotten the dinosaurs. This shows his zero understanding of the matter.

Conclusions

The title of the book claims much more than it delivers. Most of the author's proposals are scenarios, while others are *ad hoc* evolutionary conjectures based on the diversity of biochemical and other life processes. Wagner has a tendency to focus on relatively minor matters and blow them all out of proportion. Still other proposals by the author assume the arrival of the fittest as an outcome. They most certainly do not demonstrate it.

References

1. For example, see Copley, S.D. *et al.*, The whole genome sequence of *Sphingobium chlorophenolicum L-1*: Insights into the evolution of the pentachlorophenol degradation pathway, *Genome Biology and Evolution* **4**:184–198, 2012. Van der Meer, J.R. *et al.*, Evolution of a pathway for chlorobenzene metabolism leads to natural attenuation in contaminated groundwater, *Applied and Environmental Microbiology* **64**:4185–4193, 1998.
2. Even proponents of the RNA world admit that it has plenty of holes, but claim that it's still better than other theories of chemical evolution, which is saying very little apart from their *a priori* commitment to materialism—Bernhardt, H.S., The RNA world hypothesis: the worst theory of the early evolution of life (except for all the others), *Biology Direct* **7**:23, 13 July 2012, doi:10.1186/1745-6150-7-23.
3. Doyle, S., Antifreeze protein evolution: turning wrenches into hammers, *J. Creation* **25**(2):14–17, 2011.
4. See Sarfati, J., Review of Climbing Mount Improbable, *J. Creation* **12**(1):29–34, 1998; creation.com/dawkins.