

THE RNA WORLD
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I love life - not just living, but, life *qua* life.

The origin of life has always fascinated me. As a kid in high school, I perceived the Miller experiment¹ as essentially "settled" science on the question of the generation of spontaneous life. Mind you, as a kid in high school, I thought a LOT of science was "settled science."

The work by Stanley Miller and Harold Urey was a milestone for the idea of abiogenesis of life (biopoesis). As I got older and more ensconced in science, my atheism grew in proportion with my confidence in Scientism and eventually, I **knew** spontaneous biopoesis was how life started and I **knew** that Darwinian evolution took us from simple

amino acids and sugars and phosphates, to proteins, and then cells and now the complex diversity of life we see today.

Technologically, we have come a long way since I was in high school and an even longer way since Miller and Urey performed their work. However, in important ways, we are still stuck in the middle of the 19th Century with an idea that is like a corpse in the room, and we as a society haven't had the courage to remove it in spite of the stink.

Currently it is fashionable in scientific circles to favor the idea of biopoesis, and one can demonstrate they sit at the table with the cool kids by raising the issue of the "RNA World." The RNA World is an hypothesis that prior to the advent of proteins, small molecules spontaneously came together and served as both the molecular blueprints for genetic information storage as well as the self-replicating catalysts needed to overcome thermodynamically unfavorable assembly of larger molecules.

According to the idea, such molecules would then go through random mutations, and grow, and through Natural Selection, those molecules would survive and the chain lengths would get longer until such a time the molecules were sufficiently large to act as self-assembling organisms, such as simple viruses (like the current virus that is getting so much attention). Eventually, these complex molecular assemblages would, naturally, evolve into simple prokaryotic cells, which would, obviously, evolve into eukaryotic cells, which would (of course) further evolve into complex life forms and things like cyanobacteria would evolve into Trilobites which would (naturally) evolve into elephants, and bears and whales and the like. It's so obvious.

This was all pleasing to someone like me who liked their atheism and Scientism and felt rather smug and secure wrapped in my Scientism superman cape. Unfortunately, the human mind is as dynamic as life and it too evolves, and the deeper I got into molecular biology and higher math, my growing insights into evolution, geology, and microbiology began asking uncomfortable, nagging questions. The deeper I receded into facts and science to save my desired life view, the more nails were added to the coffin of Darwin and abiogenesis.

Eventually one morning, at 4 a.m. while wrapped up in 3-D calculus, Pribnow boxes and reverse transcriptases, I was at a cross-roads. That's when I met Procrustes of Greek mythology. Procrustes was a rogue smith and bandit on Mount Korydallos. Procrustes had a bed in which he invited passers-by to spend the night. This scoundrel would then force the his poor victim to fit the bed - *exactly*. He would set about them with his smith's hammer and stretch them if they were too small or lop off body parts that were too big until the victim fit the bed *exactly*.

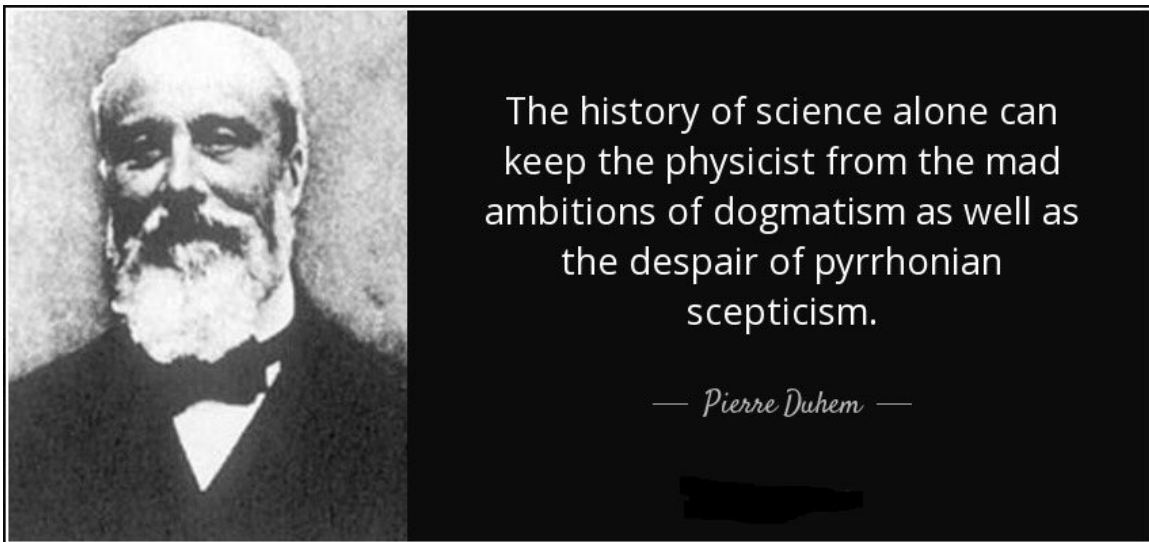
And that is when I realized that is where we are in the biological sciences today and I was being forced to make a choice. I could either adopt the Procrustean Bed of Scientism and Natural Reductionism without metaphysics, or I could accept that Scientism and Natural Reductionism was wrong.



I saw that "mainstream science" had evolved into dogmatic Scientism wherein *a priori* constraints are mandated and like Procrustes, scientific data are hammered and bent and folded and stretched until they fit the mandatory dogmatic bed in which the researchers lay. That bed into which all facts shall fit is Darwinism and Natural Selection.

Contrary to the misinformation peddled by so many, this isn't actually a choice between science and religion, and neither is it an "either-or" proposition. That is, by rejecting the dogma of Scientism and Darwin, one is not necessarily embracing religion. The "hard core, card-carrying atheist," Thomas Nagel explains² why he rejects Reductionism in general and Darwinism in particular and yet he hasn't embraced Christianity. Nagel is in good company with other atheists and doubters such as Jerry Fodor,³ Noam Chomsky⁴ David Berlinski,⁵ Stephen J Gould⁶ and many others. These folks who would probably be intellectually hostile to Fundamental Evangelical Christians reject Darwinism (more specifically the mindset that adheres to it) and yet they do not see Christianity as a necessary alternative.

In what was termed "still birth science," the Hungarian Physicist Stanley Jaki spoke of dogmatic Scientism "*...camouflaged in scientific garb, it is a process which effectively hides from view facts that are neither of the making of science, nor can science make anything of them. A "scientific stance that stimulates insensitivity to those facts is a parody of science, worthy of being called plain antiscience."*"⁷ He like the biologist Douglas Axe, asks what is at risk if we intentionally blind ourselves to the scientific facts in favor of an Enlightenment dogma?



Is that writ too large? Consider the words of Francis Crick: "*Biologists must constantly keep in mind that what they see was not designed, but rather evolved.*"⁸ But, what about the facts?

Consider Eugenie Scott of the National Center for Science Education who has often stated that any inclusion of "God" must always be removed from any and all discussions of science *even where the data points to the evidence of such an existence.*



What these folks (and their ilk) don't understand is that science developed in the Western World precisely *because* of a belief in God and not in spite of religion; it is for this reason that most of the greatest early scientists were Catholic, and The Church was the ONLY scientific organization on the planet - even the term "the scientific method" was invented by the Catholic Church.

In any event, back to RNA - shortly after the Wistar Institute of Anatomy and Biology Symposium (University of Pennsylvania) in 1966 the bottom fell out of the neo-Darwinian theory and left many biologists looking for solid ground upon which to stand.

Simultaneously, the idea of abiogenesis also fell out of favor as more and more real science and advances in genetics and molecular biology began to demonstrate that the very Pillars of Darwinism were crumbling and indeed, that the foundations upon which the Pillars were built, may have been set in shifting sands and not concrete.

But then came the discovery by Thomas Cech and Sidney Altman that some RNA, which is informational, can also, by itself, catalyze biochemical reactions. Suddenly the idea of a realistic abiotic RNA World emerged as a possible contender for the beginning of life through abiogenesis.

Cech made it possible to be an intellectually fulfilled atheist! (*pace* Richard Dawkins).

The Cold Spring Harbor Laboratory Symposium became the vanguard for the presentation of the new abiogenesis movement and a series of papers were assembled at those meetings. Following the presentations, the presenters put together their lectures and the papers were published in bound form as a Monograph Series.

Since I was getting pelted with new arguments regarding The RNA World I knew I had to better understand the argument, so I decided to go to the source - But which of three editions? After hearing some of the original authors discussing the topic, I noticed that they thought the second edition was the better of the three, and so I selected that one.

The RNA World, Second Edition, became one of the most important Science Fiction books, I have ever read. Why do I refer to it as "Science Fiction"? Because that accurately describes the content. The book is a scientific book, written by scientists for scientists. A casual reader would not likely get through the first chapter without having to first take some courses in molecular biology - thus "Science."

But also, the book is choker block full of great Fiction - In the book, Francis Crick talks about what to do when the facts aren't supporting your work and nature stubbornly refuses to fit your Procrustean Bed. Crick states: "*Where possible let Nature do the work, and if she proves a little slow, take a whip to her.*" By God, beat her until she fits that damned bed!



We have the fantasy synthesis of ribose (Mojzsis, Krishnamurthy, Arrhenius) - well actually the facile synthesis of ribose, clarifies the authors with complete honesty. They then go on to provide a very good discussion of the problems induced by geochemical and geophysical constraints on spontaneous emergence of necessary chemical fragments and they discuss the myths of Darwin's famous Hot Pool.

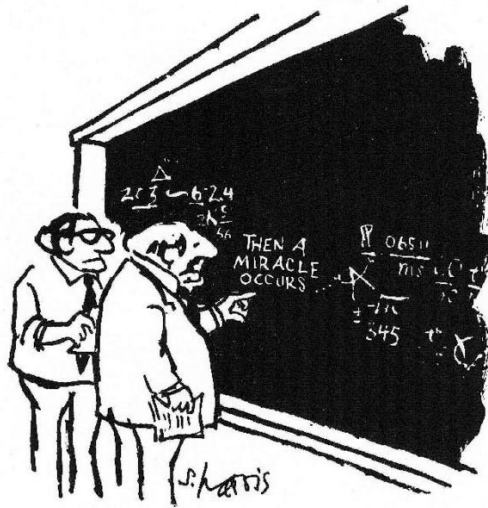
There are cryptic glimpses of cracks in the Darwinian dam, such as the final sentence in Bartel's section on RNA-catalyzed RNA polymerization: "*If Darwinian evolution can be established, it will be fascinating to follow the development of these embryonic life forms.*"

In Harry Noller's section "On the Origin of the Ribosome: Coevolution of Subdomains of tRNA and rRNA," we also see a nod to Jerry Fodor's powerful argument of necessary teleology of Natural Selection and Michael Behe's powerful argument of "irreducible complexity"⁹: "*As already pointed out, the RNA World could not have "known" that it was in the process of evolving protein synthesis until the whole process became functional.*"

We see amazing flights of fancy (Gilbert and de Souza) wherein the authors conflate self assembly with "life." The argument is essentially if one can produce a self-replicating chemical complex, then one has created life. The authors then walk the reader through the very simple and obvious step-by-step process of simple chemical complex to higher level living organisms. The pages read like Kipling's "Just-So" stories where you start with a molecule which then changes into a catalyst, and then that changes into a ribosome and through Natural Selection, that becomes DNA and that becomes RNA that evolves into protein producers... and just-so. No details of how this would all come about, but by-gum it makes for gripping bed time reading.

The RNA World is a wonderful, albeit speculative "what if" playground of thought. It's not presented as a definitive explanation of how things are. Again, as an example of transparency, honesty and jocularly, we see in the section by Joyce and Orgel: "*It should be emphasized that the existence of an RNA World as a precursor to our DNA/protein world is an hypothesis. We find it an attractive hypothesis and believe that it derives some support from the results of the experiments that it has inspired. ... We recognize, however, that not everyone will find the available evidence compelling. In our initial discussion of the RNA World we will accept The Molecular Biologist's Dream: 'Once upon a time there was a pre-biotic pool full of β -D-nucleotides...'*"





"I think you should be more explicit here in step two."

Don't get me wrong, Gilbert and de Souza also provide real science and their section on introns is very good, and they are sincere and honest. They speak frankly about the "chicken-and-the-egg" problem and the Eigen limit problem and the impossibility of the random generation of RNA enzymes of appreciable size.

In fact, all the contributing authors seem to be sincere and none are trying to pull the wool over the reader's eyes or trying to lead the reader into thinking that this nut has been cracked. McKay and Wedekind's excellent section on ribozymes succinctly state *"It is fashionable to suggest a self-replicating ribozyme as the initial perpetrator of an RNA World; at the same time it is difficult to imagine plausible routes by which such a ribozyme could emerge in a single step from prebiotic pools of random mono- and poly nucleotides."*

At many points, the various authors get bogged down in spurious details and that tends to lead to getting off track. Imagine that you are an astronaut who has just landed on the alien, lifeless, Planet Zymurg (2 light years from Earth). As you are moving about collecting your rock samples, you stumble upon a beautiful three-speed Raleigh Bicycle (circa 1925) leaning against the back of a large boulder. NASA directs you to immediately file a report. You rush back to your landing craft and prepare a 700 page report on the bicycle. You describe the elemental analysis of the various alloys, the gear ratios of the sprockets, the chemical breakdown of the rubber in the tires, a detailed description of the chain, the saddle, you even have counted the threads in the various screws and provided a complete inventory. NASA is not amused. What they wanted was a report on how the damned thing got there! It may be the most thorough description of a bicycle ever produced by the human intellect, but those details, however accurate, do nothing to speak to the central question - what is a Raleigh Bicycle doing on the Planet Zymurg?

And so it is with much of the book, which is unquestionably about RNA, and only secondarily about how we got it, and how did it get here.



The RNA World is a wonderful book that discusses bicycles, in GREAT detail, and the authors deftly explain how bicycles can be spontaneously generated, and all they ask of the reader is to allow them the stipulation of an unspoken, fully staffed, bicycle factory. The conclusions of the authors can be summed up thusly:

"If we had eggs, we could have eggs and ham, if we had ham."

¹ Miller, Stanley L. (1953). "Production of Amino Acids Under Possible Primitive Earth Conditions" Science (New Series) 117 (3046): 528–9 (1953)

² Nagel T. *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature is Almost Certainly False*, Oxford University Press, 2012

³ Fodor J, Piattelli-Palmarini, M: *What Darwin Got Wrong* (2010) Farrar, Straus and Giroux Publishers

⁴ Berwick R, Chomsky N, *Why Only Us?* (2017), MIT Press

⁵ Berlinski D, *The Devil's Delusion* (2009), Basic Books Publishers

⁶ Gould, SJ, "Wonderful Life" (1989) W. W. Norton & Co. Publisher

⁷ Jaki S, *The Savior of Science*, 2000 Eerdmans Publishers

⁸ Crick, F. *What Mad Pursuit*, Basic Books, New York, NY, p.138, 1988.

⁹ Behe MJ, *Darwin's Black Box: The Biochemical Challenge to Evolution* (1996) Free Press Publishers

