

# Review of: "Numeric Structure of Genetic Code in Natural Evolution: Energy Grounds"

Okechukwu Nwamba<sup>1</sup>

<sup>1</sup> University of Idaho

**Potential competing interests:** The author(s) declared that no potential competing interests exist.

## Review Report for **Numeric Structure of Genetic Code in Natural Evolution: Energy Grounds**

**Andrei Moldavanov**

I love it that the author starts off with a definition of the problem statement (first statement in introduction).

There are some not true or wrongly misplaced conceptions which the author introduced in the abstract stage and even propagates in different dimensions afterwards (that is, in the body of the write-up):

In the abstract, the author writes "Alternatively, we observe that energy evolution for cells can be also presented as the random coexistence of three interchangeable metabolism pathways - glycolysis, photosynthesis, and oxidative metabolism." In this case, I believe the author generalized "cell" to a degree not acceptable. For example, glycolysis occurs in mammals, yeasts, and some microbes as well as "oxidative metabolism". Both energy pathways are unique and distinct. Indeed, you can move from glycolysis to oxidative metabolism (but not in the reverse direction and so another example of why you can't even begin to use the word interchangeable) but both pathways are distinct and not the same as "interchangeable" would suggest. On the other hand, glycolysis is mainly found in plants and or green chromophore harboring organisms. So, it is not even found in mammals, for example. You can't apply interchangeable to all three processes then.

In the second paragraph of the Introduction, "It is well-agreed that an essence of GC is to instruct the cell on how to build DNA. Then, it is logical to believe that GC was created and naturally integrated into the primordial environment prior to DNA arrival," the author assumes that the genetic code, GC is different from the DNA. Not true. The genetic code is housed by the DNA and so, could not have existed prior to the DNA. Saying the GC existed prior to the DNA is saying that the GC existed before itself! Again, the author makes a general assumption that the genetic code is solely confined to DNA bases. Not true, DNA (first genetic code), proteins (second genetic codes) and even membranes (third genetic codes) have all been postulated as genetic codes! Reading further I discovered that the author is correlating the existence of individual base pairs as genetic code. Not true. It is a genetic code when three base pairs are linked together and can code for a given amino acid or stop codon. Thus, each base, by itself and isolated, is not a genetic code.

The author can argue that the pathway for the expression (and consequently replication) of the GC existed before the appearance of the GC (which is same as saying that the pathway for the replication of the DNA existed before the appearance of the DNA on the scene). In fact, the author would express and elaborate on the four base pairs of the GC

some sentences afterwards without recognizing that the GC is just the codon expression of any three of the 4 bases at any point in time (thus, there are 64 code words possible from an 'alphabet' of 4 letters and any linear arrangement of the 3 letter will code for an amino acid).

“Despite substantial contribution, the above theories do not provide sufficient arguments in favour of the existing numerical basis of GC as 3, 4, 20, 64” Honestly, because 64 codons can be mapped to 20 amino acids (and 2 stop codons – I wonder why these 2 stop codons were not considered as one of the “existing numerical basis of GC”), and 4 bases can be expressed as triplets (3) to code for an amino acid sequence... I wonder if mathematical equations to result in these numbers would be considered as the “El dorado” or cracking the genetic code with respect to their existence and biochemical functions.

I respectfully disagree with the author that each of the DNA bases (what he calls the Genetic codes) existed in the pre-biotic times, even before the evolving cells. Two reasons for this. The DNA bases are too complex to have existed in the gaseous state of the earth in the prebiotic times in the absence of an intelligent designer at work. Since the intelligent designer was not assumed *a priori* by the author, I will not credit that to explain the existence of the DNA bases before the ECs. Secondly, the Ulrich experiment in the early 60s clearly shows that a primitive form of the purine and pyrimidine bases were synthesized under electrical charged systems, pressure, and the right constituent gases. This experiment is the go-to proof for the existence of the DNA base constituents but not the fully finished nucleic acids.

The author makes mention of three energetic pathways in the EC: oxidative metabolism, glycolysis, and photosynthesis. He mentions that the EC uses all three energetic pathways as of when needed and that substrates can be interconverted between any of these energetic pathways. Two reasons why I disagree with this assumption. A) An EC that can interconvert between three energetic pathways is too complex to be an and I wonder why such a cell would be lost to evolution. Such a cell would be too advantageous to lose simply because it is evolutionary too advantageous compared to the alternative options of separate plant and animal energetic pathways. B) Glycolysis can feed substrates into the oxidative pathway but not in the reverse direction. There is no clear pathway to feed substrates to photosynthesis. Thus, this hypothesis cannot hold in the absence of the Pentose Phosphate Pathway (PPP) which is the pathway that can feed and receive simultaneous to all the three afore mentioned pathways. If the PPP is included in the energetic pathways, then the hypothesis of “3” breaks down to “4” and it is not conceivable for the other three to stand and communicate without the PPP. For further synthesis of nucleotide via the synthesis of 5-carbon chain sugars, the PPP is essential and inevitable. In the absence of the PPP, the GC cannot form since there would have been a truncation in their synthesis via the absence of the sugar moiety. Moreover, the author did not take this pathway into consideration that the only way the GC would be replicating is that their components are present. He didn't account for this. Importantly also are the enzymes. It is widely believed that the enzymes of the ECs are crude. Thus, an EC with a set of complex enzymes that can interconvert amongst the three energetic pathways are too complex to be tagged “evolving”.

In the concluding sentences: “In light of this, it is possible to assert that biological evolution describes a natural process

that transfers information from the chaotic local environment into the stable chemical known as DNA [36] that should be then considered primarily as the “energy code” [37].” Is NOT true. This is because the DNA does not “transfer information from the chaotic local environment”. Rather, the DNA, with fidelity, replicates information that it is carrying unto the next generation and also serves as a template for the translation of such information to the RNA and the end game, the proteins. If the DNA transfers information from the local environment, then the question of how it sieves out “noise” from actual information in an EC leads to even more complexity.