THE ORIGIN OF LIFE AS LIFE BEING THE MOST INVOLVED WITH FUNDAMENTAL PHYSICS.

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Abstract. The origin of life can been seen as the first original anti-entropic engine with respect to a pressure-temperature reference. Therefore, under that theoretical paradigm, the chemolithoautotrophic bacteria are the best candidates by far for the origin of life. To have a more detailed description of the the origin of life, we consider the concept of "fungal catastrophe" from nuclear-biology and we also consider the many-worlds interpretation (MWI) with an almost infinitely large number of quantum parallel universes. In the present article, we will use many times the shorter designation "anti-entropic engine" instead of the longer designation "anti-entropic engine with respect to a pressure-temperature reference".

The origin of life can been seen as the first original anti-entropic engine with respect to a pressure-temperature reference. Therefore, under that theoretical paradigm, the chemolithoautotrophic bacteria are the best candidates by far for the origin of life. Let consider the first original anti-entropic engine with respect to a pressure-temperature reference when it was half assembled. The second law of thermodynamic would destroy it. More specifically, the combination of the Brownian movement and the chemical reactions would destroy it with a statistical probability almost infinitely close to one. Therefore, to explain the origin of life, we should consider the many-worlds interpretation (MWI) with an almost infinitely large number of quantum parallel universes. The combination of the Brownian motion and the chemical reactions would require many more lucky events than ionizing-radiations in order to assembly the first original anti-entropic engine with respect to a pressure-temperature reference. In deed, the Brownian motion and the chemical reactions have a much smaller energy than ionizing-radiations and the smallest known chemolithoautotrophic bacteria have $\sim 2.4 \times 10^{11}$ atomic nuclei about. To assembly the smallest known chemolithoautotrophic bacteria with lucky ionization-radiation events, it would require a minimal amount of ionizing radiation at a temperature close to the absolute zero and 100 million smaller than the required minimal amount of Brownian motions and chemical reactions.

In the present article, we will use many times the shorter designation "anti-entropic engine" instead of the longer designation "anti-entropic engine with respect to a pressure-temperature reference".

From the previous theoretical considerations, we can derive an equation of the origin of life. Since the ionizing-radiations heat the surface of the telluric planet where the assembly processes took place for the first original anti-entropic engine and the

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surface temperature of that telluric planet should be lower as possible. Therefore, we can derive the following formula :

(1)

$$E_O \cong (T_{Oldest-Earth-Life} - T_{Original-Life}) \times \sigma \times \left(\frac{T_{CMB}}{(1 - T_{Original-Life}/T_{Universe})^{2/3}} \right)^4 \times 2 \times r_O \times d_O$$

(2)

$$\cong \pi \times r_O^2 \times d_O \times \rho_O \times N_A/M_w^O \times \langle E_{Cosmic-Ray} \rangle$$

(3)

$$\cong \pi \times 0.25^2 \times 2 \times 10^{-18} \times 1\ 000\ 000 \times 6.02 \times 10^{23}/6.69 \times 300 \times 10^6 \times 1.602 \times 10^{-19}\ J$$

(4)

$$\cong 1.7\ J$$

(5)

$$F_O \cong (T_{Oldest-Earth-life} - T_{Oldest-Planet}) \times \sigma \times \left(\frac{T_{CMB}}{(1 - T_{Original-Life}/T_{Universe})^{2/3}} \right)^4$$

(6)

$$\cong \frac{\pi}{2} \times r_O \times \rho_O \times N_A/M_w^O \times \langle E_{Cosmic-Ray} \rangle$$

(7)

$$\cong 365.25 \times 24 \times 3600 \times (8.8 - 3.22) \times 10^9 \times 5.67 \times 10^{-8} \times \left(\frac{2.7626}{1 - 8.8/26.7} \right)^4\ J/m^2$$

(8)

$$\cong 1.7 \times 10^{12}\ J/m^2$$

We have assumed that each single cosmic ray can move $m_w \cong 6.69$ atomic nuclei at the right assembly position of the first original anti-entropic engine (m_w is the average atomic mass of the human body). From the above formula about the original life assembly, the original life has started 8.8 billions years ago about and 5.6 billions years before the oldest Earth life. For comparison, the oldest known telluric planet is $Psr\ B1620 - 26\ B$ and it has an estimated age of 12.7 billions years old.

The telluric planet hosting the original life was a very cold telluric planet and was traveling very far from any stars during 5.6 billions years until it was gravitationally captured by an astrophysical object emitting a very large flux of ionizing-radiations (quasar?). During that gravitational capture process, the telluric planet hosting the original life had a rotation-axis almost perpendicular to the orbital plane and had a large crater at one of the rotational-pole hosting the original life. Indeed, the very cold telluric planet hosting the original life should warm-up without exposing the first original anti-entropic engine to the ultraviolet light of the astrophysical object emitting a very large flux of ionizing-radiations. During that critical step, when that crater rotational-pole of that telluric planet warm-up enough, the first original anti-entropic engine would start to grow and colonize it thanks to a highly bacterial motility. From that initial rotational-pole crater colonization, the first original anti-entropic engine would colonize larger areas and would involve into a new ionizing-radiation-resistant, non-spore-forming, desiccation-resistant, extremophilic bacteria colony over a period of 5.5 billions years about. The astrophysical object emitting a very large flux of ionizing-radiations on the telluric planet hosting the original bacteria colony would blow into a kind of supernovae in order to disperse that bacteria colony around the Milky Way and to ultimately reach the Earth planet. The original bacteria colony should involved into a ionizing-radiation-resistant one in order to resist against the cosmic rays during its Milky Way travel. The original bacteria colony should also involved into extremophilic one in order to resist against the initial supernovae blast and against the final atmospheric reentry on Earth of its Milky Way travel. The original bacteria colony should also involved into a non-spore-forming, desiccation-resistant one in order to have a large genetic margin with respect to the "fungal catastrophe". Altogether, some areas of the telluric planet hosting the original bacteria should be warm, very dry and having a high level of a "constant" ionizing-radiation background. A "constant" ionizing-radiation background, with respect to the spore-forming bacteria which are close to the "fungal catastrophe", can be achieved with a very fast rotating telluric planet. A very fast rotating telluric planet should be enough big to avoid a disintegration by the centripetal acceleration and in that case, the rotational-poles of a more flattened sphere would be more protected from the ultraviolet light and from the ionizing-radiations. The extremely short genome of the original bacteria colony should involved into a extremely long genome in order to increase further the genetic margin with respect to the "fungal catastrophe". While the original bacteria Aquifex pyrophilus is a strictly chemolithoautotrophic bacteria and it is absolutely not a photosynthetic bacteria since it has to colonize the very dark original rotational-pole crater, the original bacteria does not necessary involve into a photosynthetic bacteria but involving into a photosynthetic bacteria like the cyanobacteria Chroococcidiopsis may make much easier to satisfy all the previous mentioned constraints. The original bacteria colony and the first Earth bacteria colony should trivially be autotrophic as well since there in no organic matter before life origin and before its arrival on Earth.

From all these constraints on the evolution of the original bacteria colony, we can deduce it has involved into the cyanobacteria Chroococcidiopsis. Some strains of the cyanobacteria Chroococcidiopsis may have "roughly" involved in the reverse way on Earth and may have become genetically close to the original bacteria. In that case, Aquifex pyrophilus is an excellent candidate for being roughly similar to the original bacteria. The original rotation-pole crater is a relatively limited environment and the original bacteria may have evolved only a little before going out of it. Moreover, the original bacteria had to survive a very long warming period of the very cold telluric planet. Therefore the original bacteria should be protected inside a rotational-pole crater but the original bacteria need also to be resistant against ultraviolet lights and ionizing-radiations since it can not evolve a lot inside this rotational-pole crater before going out of it.

To conclude, the origin of life happened within an almost infinitely small fraction of quantum parallel universe : $\sim 1/10^{10^{11}}$. The original life scenario follows a max-min procedure with a particularly very narrow range for the original life scenarios with a significantly larger probability while the absolute probability of an original life is almost infinitely small. Therefore, the origin of life is the largest observation selection effect by far and the strongest experimental confirmation of the many-worlds interpretation (MWI).

To conclude further, the bacteriophage play a critical role into the genetic bacteria evolution on Earth however they are not the original life. How the original bacteria could involve without bacteriophage on the telluric planet hosting the original life? During the period where an astrophysical object emitting a very large flux of ionizing-radiations on the telluric planet hosting the original life, it allows to do a very big genetic evolution of the original bacteria. From that later genetic evolution stage, the bacteriophage emergence is extremely way more lucky to happen than happening at an earlier genetic evolution stage.

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