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LIFE EVOLUTION STATISTICS ON EARTH AND EXOPLANETS

Abstract

This presentation offers a vision of how evolutionary life processes can be modelled mathematically.

It gives a mathematical description that can be used not only for the full evolution of life on Earth from RNA to humans, but also for the possible evolution of life on exoplanets.

The main premise underlying this mathematical theory is that the Geometric Brownian Motion (GBM) can be applied as the key stochastic process to model the evolution of life. In the resulting Evo-SETI (Evolution and SETI) Theory, the life of any living thing (a cell, an animal, a human, a civilization of humans, or even an ET civilization) is represented by a b-lognormal, i.e., a lognormal probability density function starting at a precise instant in the time (b, birth) then increasing up to a peak time (p), then decreasing to senility time (s) and finally decreasing as a straight line down to the final time of death (d).

Using this mathematics, we arrive at remarkable conclusions on the development of life and the possibility of extraterrestrial life.

Finally, we present our Scale for Life in the Universe, assuming that the unit of the scale is 1 EE (Earth Evolution) amounting to the evolution of life on Earth since 3.8 to 4 billion years ago. For planets like Mars we have an EE much less than 1, while for hypothetical ET Civilizations more advanced than Humans, one gets an EE much higher than 1.

All these many mathematical new results had been published by this author in the years 2010-2020 in some 15 papers published in prestigious journals like Life, the International Journal of Astrobiology, OLEB (Origin of Life and Evolutionary Biosystems) and Acta Astronautica.

In February 2021 this author collected all his results and published them in a big (878 pages) book entitled "Evo-SETI - Life Evolution Statistics on Earth and Exoplanets"

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