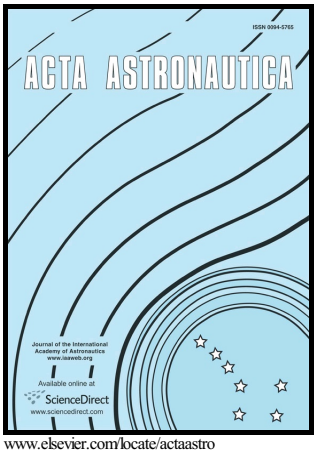

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ABSTRACT. Ray Kurzweil's famous 2006 book "The Singularity Is Near" predicted that the Singularity (i.e. computers taking over humans) would occur around the year 2045. In this paper we prove that Kurzweil's prediction is in agreement with the "Evo-SETI" (Evolution and SETI)" mathematical model that this author has developed over the last five years in a series of mathematical papers published in both Acta Astronautica and the International Journal of Astrobiology.
The key ideas of Evo-SETI are:

1) Evolution of life on Earth over the last 3.5 billion years is a stochastic process in the number of living Species called Geometric Brownian Motion (GBM). It increases exponentially in time and is in agreement with the Statistical Drake Equation of SETI.
2) The level of advancement of each living Species is the (Shannon) ENTROPY of the b-lognormal probability density (i.e. a lognormal starting at the positive time b (birth)) corresponding to that Species. (Peak-Locus Theorem of Evo-SETI theory).
3) Humanity is now very close to the point of minimum radius of curvature of the GBM exponential, called "GBM knee". We claim that this knee is precisely Kurzweil's SINGULARITY, in that before the Singularity the exponential growth was very slow (these are animal and human Species made of meat and reproducing sexually over millions of years), whereas, after the Singularity, the exponential growth will be extremely rapid (computers reproducing technologically faster and faster in time).

But how is this paper structured in detail?
Well, first of all (Part 1) we describe what the GBM is, and why it reflects the stochastic exponential increase that occurred in Darwinian evolution for over 3.5 billion years. Please notice that the denomination "Geometric Brownian Motion" (taken from Financial Mathematics) is incorrect since the GBM is NOT a Brownian motion as understood by physicists (i.e. a stochastic process whose probability density function (pdf) is a Gaussian). On the contrary, the GBM is a lognormal process, i.e. a process whose pdf is a lognormal pdf.
Next (Part 2) we compute the time when the GBM knee occurs (i.e. the time of minimum radius of curvature) and find what we call the knee equation, i.e. the relationship between t_knee, ts (the time of the origin of life on Earth) and B (the rate of growth of the GBM exponential. This equation holds good for any time assumed to be the Singularity time, either in the past, or now, or in the future.
Then (Part 3) Ray Kurzweil's claim that the Singularity is near becomes part of our Evo-SETI Theory in that t_knee is set to zero (i.e. approximately nowadays, when compared to the 3.5 billions of years of past Darwinian evolution of life on Earth). This leads to a very easy form of the GBM exponential as well as to the discovery of a pair of important new equations:

1) The inverse proportionality between the average number of Species living NOW on Earth and B, the pace of evolution. In other words, it would be possible to find B were the biologists able to tell us "fairly precisely" how many Species live on Earth nowadays. Unfortunately, this is not the case since, when it comes to insects and so on, the number of Species is so huge that it is not even known if it ranges in the millions or even in the billions.
2) More promising appears to be another new equation, that we discovered, relating the time of the origin of life on Earth, ts (that is known fairly precisely to range between 3.5 and 3.8 billion years ago) and the average number of living Species NOW.

Finally, the mathematical machinery typical of the Evo-SETI theory is called into action:

1) The Peak-Locus Theorem stating that the GBM exponential is where ALL PEAKS of the b-lognormals running left-to-right are located, so that the b-lognormals become higher and higher and narrower and narrower (with area =1 as the normalization).
2) The Shannon ENTROPY as EVOLUTION MEASURE of the b-lognormals, more correctly with the sign reversed and starting at the time of the origin of life on Earth, that is rather called EvoEntropy.
3) After this point, one more paper should be written to describe… how the b-lognormal's "width" would correctly describe the "average duration in time" of each Species (before the Singularity) and of each COMPUTER Species (after the Singularity)…
4) …but this is "too much to be done now", and so we leave it to a new, forthcoming paper.

Keywords: Ray Kurzweil, Singularity, Darwinian Evolution; Molecular Clock; Entropy; SETI.