A Probabilistic Proof of the Existence of Etraterrestrial Life

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Abstract

Until the current moment, mankind is not realized that there is a diverse population of intelligent civilizations living in our universe. In the current article we will deduce the occurrence/existence of extraterrestrial life by mathematical proof. I would show you that even inside our galaxy, the Milky Way, a sufficient number of alien creatures are living. The first section includes an algebraic probabilistic proof when the event of life is not highly biased and the second section includes a proof by contradiction that describes the event fundamentally. It's a mathematical proof for the extraterrestrial life debate, for the first time in mankind's history.

Consider the life as our favorable incident. Let us to make a mathematical proof for the question "whether life exists beyond Earth?" The basic assumption behind the existence of extraterrestrial intelligence is inferred from the existence of human intelligence and the size of the known universe. We accept the *Copernican* principle (generalized to the relativistic concept) that assumes humankinds are not privileged observers of the universe.[1] A propositional basis is constituted by (the influential figure) *Hawking* that the sheer scale of the universe makes it improbable for intelligent life not to have emerged elsewhere.[2] Unless life may happen somewhere, or life may not happen somewhere, there is not a third option available about this especial issue (We aren't discussing about different types of life at all in the entire work. And only in our mathematical model, life is our favorable incident.)[3] Let, alike a coin that has two sides, there be something the same about life.[1] Life may happen or it may not happen. We

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[1] When a woman gives birth to a few babies, then it's a habit for mathematicians to say the child can be either a boy or a girl. They aren't completely wrong. A baby can be a girl, a boy, or a hermaphroditic, but the probability of a baby girl birth is considered as 1/2 in the probability model. Imagine, we have 10 planets that life may happen on some of them or it may not happen. The Bernoulli distribution gives us the entire requirements to calculate this probability, but meanwhile you may like to use the applications of the negative

use the *Bernoulli* distribution model[4][5] as a basis to calculate the following experiments (Note: We show a ***true*** relation with ***1***, and a ***false*** relation with ***0***.[3] We show the ***sum of the entire probable types of happening of an event*** with ***1*** also).

We make an interactive probabilistic proof for the extraterrestrial life debate by mathematics that:

First, we must proof or get ensured, there are some planets like Earth available so that we calculate the probability of obtaining our favorable outcome that "life of intelligent bodies may happen on them". It's not important, there is an especial planet like the Earth exists that intelligent life is observable there, in this planet. But meanwhile it's important, does something which we call intelligent life (for an observer who is living on a particular celestial object) a probable incident* or not? You (the observer body) are alive so at least one intelligent life exists in our universe.[2] On November 4, 2013, astronomers reported, based on Kepler space mission data, that there could be as many as 40 billion Earth-sized planets orbiting in the habitable zones of sun-like stars and red dwarf stars within the Milky Way galaxy.[6][7] 11 billion of these estimated planets may be orbiting sun-like stars.[8] The nearest such planet may be 12 light-years away, according to the scientists.[6][7] So it's not necessary that we calculate it once again, we only calculate the probability of life on other planets (Earth-analogs).[3] If somewhere there isn't something alive so it's no life there.

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binomial distribution also. Imagine the Earth analogs like lots of light bulbs that can either get switched on or remain off. Once I was discussing with a Russian mathematician (A. K.), and I convinced there is an issue/question that he asked me "...virus is not alive, neither dead....Only when virus enters another cell, it functions as alive....Life may have some different forms than its current form on the Earth." But I must note you, scientists usually make a mathematical (probability) model before they discuss about an especial issue. For the current calculations, it's important that life is a potential event. We already made two imaginative groups (Set A & Set A'), viruses and other forms of complex proteins, nucleic acids, and other things/agents won't get considered as the members of the intelligent creatures group (Set A) that we can freely define their properties. It's not that complex, its the 6th basic property of Boolean algebra that *B has a unary operation $a \to a'$ of complementation, which obeys the laws $a \wedge a' = \emptyset$, $a \vee a' = I$ (Birkhoff and Mac Lane 1996).*

[2] We won't rely on the issue that observer body be the observer body from Earth (it's optional). Currently* an observer body exists on Earth. When we don't rely on this issue, then a delta, which we will define later, can give us different answers. In fact it shows us "life" is a certain possiblity but "being alive" is an option (outcome).

[3] Extremely high amount of Earth-like planets in the entire universe would cause, we naturaly determine in our minds that surely (probability = 1) life will happen somewhere else, even when there is no life happened on the Earth; by intuitionism. We won't create an unreliable geometrical structure including combination of a chaos function (such as the lyapunov exponent, examining the butterfly effect) with a limit which approaches infinity, because while the universe (and space) is infinitely large but the Earth-like planets are discrete from one another! Additionally, while the Drake equation is given to make an estimation for the number of this extraterrestrial population, but neither it is a proof for the existence of extraterrestrial life nor the question "whether life exists beyond Earth?". Astronomical societies emphasis, by looking to the Drake equation factors, it is obvious that none can be precisely determined by modern science. They are right, for example f_l (the fraction of planets that could support life that actually develop life at some point) is so hard/currently impossible for an astronomical society to be determined. Therefore SETI states that the importance of the Drake equation $N = R_*.f_p.n_e.f_l.f_i.f_c.L$ is not in the solving, but rather in the contemplation. However that

There is not any other selection. We define, and show this event ((life)) with gamma from now. And we define, and show the other condition ((no life)) with beta.

Let:

$$life = \gamma;\, no\, life = (life)' = \beta$$

Since there is not any other selection remained for us, and now we've concluded that γ accepts a *true* value so $\gamma + \beta$ is equivalent to T (a true relation), is equivalent to 1.[4] We can write the last equation as $life \vee no\, life \equiv T$; write down the last equation as

$$\gamma \vee \beta \equiv T$$

because it is what we see in our world. In mathematics we say, whether γ or β is happened.

We imagine $\Pr(\gamma)$ is not biased, and it's an accidental event.

You may want to go a bit further for increasing your logical insights on this issue, and explain that since $p + q = 1,\ p \simeq q \Rightarrow 2p \simeq 1$, we can write $\Pr(\gamma) + \Pr(\beta) = 1,\ \Pr(\gamma) \simeq \Pr(\beta) \Rightarrow 2\Pr(\gamma) \simeq 1$. You may want to explain, as $\Pr(\gamma)$ and $\Pr(\beta)$ are getting considered as the complement of each other,[5] our universal set, but meanwhile this universal set (with these prefect elements) has an empty complement set[6], it is related to a non-real, virtual complement group (which contains a false relation;[7] additionally, it isn't always the same as q[8], the unfavorable outcome, but it can be a relation on lack of happening of our favorable outcome at our set; it is untrue, it is our nullary logical connective.)[9] that is equivalent to F (also written as $\perp$ or 0). In the universe, the Earth is located also. And it's one of its planets. Earth is only one planet. So probability of selection of 1 planet only, by the total sum of an approximately infinite amount of Earth-like planets[10] for life, is approximately 0 (False), since

is not a proof ever, but an argument.

[4] Nonmonotone laws - Complementation 2: $x \vee \neg x = 1$

[5] The one's set is a complement for the other, and so theirs sets are complement for each other, but the two probabilities are not such a complement accurately.

[6] This complement set is not the A' set.

[7] Meanwhile it contains a false relation here but its self-characteristic definition is isolated from whether the group be non-real and virtual or not, since our experiences are related to logical answers of this logical relation on our empty (so it either may hold a vacuous truth relation or a false relation) set. So it can either hold a true value or a false value. It is isolated from the literary definition of reality that the truth refers to what is real, while falsity refers to what is not. If once we discuss about the logical definition of an abstraction and a virtue of reality over physical application of this definition in real world then the literary and philosophical definition of reality can have affection on these logical values.

[8] p and q are two propositions. And p is the mean, also known as the expected value.

[9] This complement is virtual and doesn't exist in reality.

[10] $(\frac{1\ Planet\ (the\ Earth)}{availability\ of\ an\ approximately\ infinit\ amount\ of\ Earth-like\ planets})$

$\lim_{i\to+\infty}\frac{1}{i}=0,\ \{\forall i \mid i\epsilon\mathbb{N}\}$.[11] But what if you imagine life may not be an unbiased event (also alike a martingale);[12] shortly I will begin to describe a suitable method for this also. For now let's come back from these further explanaitions, to the main discussion, to keep calculate the probability of life ($\Pr(\gamma)$), only for our galaxy, the Milky Way. Life surely happens on Earth so it's happened in $1\ divided\ by\ 11\times10^9$. Let, for n times life[13] write down the last event/outcome as:

$$n\gamma\frac{1}{11\times10^9},\ \{\forall n \mid n\epsilon\mathbb{N}\}$$

When life happens on Earth and it be happened in $1\ divided\ by\ 11\times10^9$ we show this small non-zero fraction ($\gamma\frac{1}{11\times10^9}$), by epsilon. This epsilon can either give us a true or a false value, since for the Earth it is successfully happened so we certainly accept that it gives us a true value; in another condition it may give us a false value as the answer. In fact, some planets alike our Earth shall be existed in the Milky Way, the event of distinguishable lives for us now would get considered on them, for which we can write down $\Pr(\gamma)_n \propto n\epsilon$.

But in another condition (over logical comparison of two different locations in space ($Earth$, and pco = a particular celestial object (abbrev.) that we may consider it as any celestial objects with an Earth-like environment such as the Earth itself), we expect, it (this epsilon) may give us a false value as the answer;[14] for the final step we will write:

$$\epsilon\equiv\delta,\ \{\forall\delta \mid \delta\in\mathbb{B}\},\ for\ \mathbb{B}\in\{0,\ 1\};$$

$$\Pr(\gamma)_{Earth}\propto\gamma\frac{1}{11\times10^9}\equiv T\Rightarrow\epsilon\equiv T;$$

[11]Now you are familiar with our model for this universe (in discrete space), one may explain that he/she would like to use the continuous probability distribution that the limit of the geometrical surface of this 1-dimentional (or even the volume of a 3-dimentional) model approaches infinity, but since there is not a plain (continuous) surface available in space, and most of the volume of space is (getting considered as empty) hard vacuum, and since life possibly shall only happen on the surface (or in waters) of planets, but it won't happen in empty (vacuum) space (nor inside the outer/inner core of planets) so the continuous probability distribution fails to describe (the basic definitions of) that model.

[12]In fact what if you imagine life may be a very biased event, and not only $\Pr(\gamma)$ is not somehow $\simeq$ with $\Pr(\beta)$ approximately, but also $\Pr(\gamma)$ is much larger than $\Pr(\beta)$, $\Pr(\gamma)\gg\Pr(\beta)$, or $\Pr(\gamma)$ is much smaller than $\Pr(\beta)$, $\Pr(\gamma)\ll\Pr(\beta)$.

[13]Since it is based on the Bernoulli distribution model, for a single incident (successful possibility) of a life in the Milky Way, the incident might come up ***life*** with probability $\gamma\frac{1}{11\times10^9}$ and ***no life*** with probability $1-\gamma\frac{1}{11\times10^9}$. The probability mass function f of this distribution, over possible outcomes k, is $f(k;\,p)=(\gamma\frac{1}{11\times10^9})^k(1-\gamma\frac{1}{11\times10^9})^{1-k}$ for $k\in\{0,1\}$

[14]As $x\equiv y$, or as $x\equiv f(x)\equiv d(A)$ so $\epsilon\equiv\delta$. And this δ may accept a true or a false value. Now you are able to distinguish, the fraction itself numerically does not contain a boolean (true or false) value, but the δ.

$$\Pr(\gamma)_{n_{(pco)}} \equiv T;\ \Pr(\gamma)_{n_{(pco)}} \equiv F;$$

$$If:\ \Pr(\gamma)_{n_{(pco)}} \propto \gamma \frac{1}{11 \times 10^9} \equiv T \xrightarrow{Then} \epsilon - T \equiv 0 \Rightarrow \epsilon + F \equiv 0 \Rightarrow \epsilon + 0 \equiv 0 \Rightarrow \epsilon \equiv 0\ (or\ False)$$

But the probability function of this epsilon won't give us a constant answer, and it gives us two different logical (boolean) values that (for its other answer) we just proved that it's possible that it gives us a false value for the delta.[15] Since:

$$\Pr(\gamma)_{Earth} \wedge (\Pr(\gamma)_{n_{(Milky\ Way \cap \neg Earth)}} \subseteq \Pr(\gamma)_{n_{(Universe)}}) \equiv T$$

when delta be equivalent to 0, since the equivalence (entirely) only holds a true relation (answer), it[16] means it's impossible that life only happens on Earth. □

So we just proved the theorem that shows us there are other intelligent bodies inside of the Milky Way that is (only) one of the galaxies of our universe.

Additionally, let me begin to describe the event fundamentally whether the life is considered as a biased event or not;[17] we can say: Let's imagine life is

[15] In fact it's very similiar to one method that we can construct to prove a limit by epsilon-delta. A proof of a formula, on limits, based on the epsilon-delta definition.

The structure of the epsilon-delta definition of its imaginative limit (since the limit gives us logical (binary) values (boolean data), the limit is not real) is: $(\forall \varepsilon \geq 0)(\exists \delta \in \mathbb{B})(\forall x \in \mathbb{B})(0 \leq |x - (0 \pm \gamma \frac{1}{11 \times 10^9})| \leq \delta \Rightarrow |f(x) - (x \pm \delta)| \leq \varepsilon)$

[16] Look at the truth table for p OR q *(Logical Disjunction)*. The logical OR operator on a relation gives us a true logical value when at least one side of the relation (one of the propositions) holds a true value only.

[17] Not only proof by contradiction is a complete proof of this theorem for existence of extraterrestrial life, but also if theoretically the biased epsilon, for example, a million (either one-millionth), or a billion (either one-billionth) times (or even more), holds the numerical value of a biased event (that these amounts of biasedness are preferably ignorable while they can affect our calculations and they won't get considered as a small fraction of the error of our calculation, but these numbers are ignorable only for such biased events (e.g. for (because), one-millionth times biased epsilon about our outcome event) may rarely happen in reality), then proof by contradiction comes as a reliable form of proof of the statements by fundamental rules of inference directly. Additionally the last probabilistic proof only explains us, life is a certain possibility (and not an optional event), somewhere in the entire universe with its vast expanse, whether this outcome happens a sufficient times, it happens on a (ignorable) floating limit point (e.g. Earth), or don't happen at all. But over combination of both mathematical methods we will make a precise and very reliable logical proof with no doubt. As we concider it as a probabilistic proof, as soon as this proof comes understandable for a crature (settled wherever it is) in the universe, it (instantaneously) does proof that he is not alone.

At this point, I was confronted with this question by some people who were not working on modern science, and were emphasizing on application of the classical mathematics that "There is not any proof here. We need a proof by high-level mathematics." I had preferred not to discuss about these kinds of simple questions here, meanwhile this is a proof which is understandable independently, but I can refer those people who need to learn generally about interactive proofs (so that they get convinced, there are several modern methods available too, that don't emphasis on traditionally basic methods; for example about approximation, validity of acceptance of a small non-zero number as the error value, interactive proof system, etc.) to the mathematical works of Goldreich, Goldwasser, and Babai.[9][10]

happened on Earth only! So it could be highly probable that this intelligent life happens somewhere else, since the Earth is infinitely small in comparison with the sum of the entire planets. But meanwhile it's[18] highly probable but it only happened on Earth. However life can happen in every planets or life can happen in one or a few planets. So if it wasn't happened on the Earth, then it was highly probable that it happens in (one, a few, several, many, or most of the) other planets, or these Earth-like planets were able to let the first signs of life get settled in one of them at least. If life was happened in one or a few planets of these billions[19] of Earth-like planets so its probability could be extremely low and highly impossible (our original assumption), because life happened only on a few of these billions[20] of Earth-like planets. So it's impossible with this extremely low probability, life happens in $\frac{1}{11\times10^9}$[21], only in one of the planets of the Milky Way[22], on the Earth. But since it is happened on the Earth, on $\frac{1}{11\times10^9}$[23] of the total Earth-like planets of the Milky Way so it's in contradict with our original assumption that its probability is extremely low. □ So we just showed that the original proposition of the theorem is false. So we concluded, life only and only can happen in more than one or a few planets[24], and it's possible that life happens on a sufficient number of Earth-like planets, with proof by contradiction.

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[18] That this intelligent life happens in another point of an infinitely large surface of points that are made up by other planets of our universe.

[19] And $\simeq +\infty$ about the entire Earth-like planets of all galaxies.

[20] And $\simeq +\infty$ about the entire Earth-like planets of all galaxies.

[21] And $\simeq \frac{1}{+\infty}$ about the entire Earth-like planets of all galaxies.

[22] Or in $\simeq \frac{1}{+\infty}$, only in one of the planets of the entire universe.

[23] And on $\simeq \frac{1}{+\infty}$ of the total Earth-like planets of the entire universe.

[24] It's exactly a truth about our own galaxy, the Milky Way, too.

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