Logic, Logic Only

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2023, v-1.2.4

Abstract

In this article, the intention is to introduce a theory about the origin of everything. The initial goal is to answer whether there is something rather than nothing. This question has preoccupied philosophy and science to this day. The answer to this question lies in the understanding that logic in its essence refers to nothingness (NOT IS - NEGATES ITSELF - SELF-NEGATION - NEGATES BEING). The self-denial of nothingness (the primordial logic) generates logical expansions that characterize the foundations of the central limit theorem. These logical expansions characterize the foundations of the central limit theorem. The steps of the logical expansion governed by probability described in the central limit theorem correspond to consciousness, the largest logical wave in a population, and its aspects: infinity, waves, time, space, fundamental forces, dark matter, dark energy, antimatter, and black hole. In other words, the infinite negation of logic (self-denial of nothingness) generates logical expansions that probabilistically will form logical waves and their sub-waves, establishing what is the fundamental nature of reality, knowledge, and existence. Logical expansions occur in the absence of time, which defines the logical essence as a generalized infinite recurrence, a constant, analogous to the infinite numbers or points that make up the interval of any given line.

Keywords: logic. nothing. everything. logical expansion. central limit theorem. consciousness. infinite. waves. time. space. fundamental forces. dark matter. dark energy. antimatter. black hole. observer and life.

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Introduction

The reasoning of this text arose as an answer to the most essential question that philosophy can formulate and that science and philosophy have not been able to fully answer so far, which is: whether there is something instead of nothing, or why is there something instead of nothing? This question was first asked by the philosopher Gottfried Wilhelm Leibniz in a letter in 1697 and is often described as the greatest philosophical question (LEIBNIZ, 1697).

The answer to that question comes from the answer of what logic is. In exploring what logic [is] and what it [IS NOT], it gave rise to a theory about the origin of everything, all things. Logic in its essence refers to nothingness, what [IS NOT], that is, it denies itself (negates itself). The self-negation of primordial logic can be abstracted recursively (negates itself, infinitely) into three axioms that are the basis of the central theorem of this theory.

The logic [NOT BEING] is in conformity with NOTHING, because if on the one hand the logic [IS NOT], on the other hand [is] its opposite, that is, illogical and unchanging. In this duality, one has existence grounded by a logic that [IS NOT], while [is] illogical, unchanging and non-existent.

The text is organized according to the following hierarchy:

1. Logic
    1.1. Logical expansion
    1.2. Central limit theorem
    1.3. Consciousness
        1.3.1. Infinite
        1.3.2. Waves
            1.3.2.1. Wavelength and amplitude
            1.3.2.2. Entanglement
            1.3.2.3. Jump
        1.3.3. Time
            1.3.3.1. Integral
            1.3.3.2. Partial
        1.3.4. Space
            1.3.4.1. Spatial plane
            1.3.4.2. Dimensions
            1.3.4.3. Movement
        1.3.5. Fundamental forces
            1.3.5.1. Gravitational force
            1.3.5.2. Electromagnetic force
            1.3.5.3. Nuclear force
        1.3.6. Spiral and orbit
            1.3.6.1. Orbits
            1.3.6.2. Dark matter and dark energy
        1.3.7. Antimatter
        1.3.8. Black hole
        1.3.9. Observer and life
            1.3.9.1. Senses
    1.4. Observations

Initially, it is defined what logic [is] and especially what [IS NOT], so its consonance with nothingness is presented. It is then described how this primordial logic, the essence of any logic, develops through its logical expansion. Then it is observed that the samples combined at each stage of this expansion characterize the fundamentals of the central limit theorem, generating new logics (logical waves and sub-waves). These are the logical aspects responsible for saying what is the fundamental nature of reality, knowledge, and existence.

1 Logic

According to the online English dictionary Collins(LOGIC. . . , 2021), the word logic refers to:

1. The system and principles of reasoning used in a specific field of study;

2. The relationship and interdependence of a series of events, facts, etc;

3. Necessary connection or outcome, as through the working of cause and effect.

The word logic or any of its principles or expressions, classical or non-classical, express a cause and consequence relationship or chained facts. Movement, change and transition can be distinguished as the essence of the above definitions. The word logic, in its essence, fits perfectly with the definition of nothing - [NOT BEING]. Logic is centered on change and change is centered on that which [IS NOT], since that which [is] (being), cannot cease to be in order to transform. Change requires that at some point something ceases to be what it was in order to be transformed. In Palmer (2020) Parmenides, the philosopher of the unity and identity of being, says that continuous change is the main characteristic of [NOT BEING]. For Parmenides the [being] is one (singular), eternal, ungenerated, and unchanging.

In this duality, existence is based on logic, which [IS NOT - NEGATES ITSELF], while [is - being] illogical, immutable and non-existent. In this way, [being] limits existence by defining the non-existent, the immutable and the illogical while [IS NOT] *ad infinitum.*

Figure 1 – Primordial Logic analogy

Line used to represent and validate the concept of primordial logic.

In Figure 1, the straight-line analogy is used to facilitate reasoning. Based on this Figure, the following observations (axioms) can be extracted in relation to the points **0**, **1** and the **interval** between them:

Point 1 - [1,1] It is illogical, as it is the unfractionated total of the straight-line, in this case the primordial premise of the logic [NOT BEING] was not met.

Point 0 - [0,0] It is illogical, since it is a null point incapable of denying itself. All logic or sublogic (logical fraction) must continue to deny itself, since this is the primordial premise of logic. Logic [IS NOT] in its essence, primordially.

Interval -]0,1[The logic is only possible in the fractional representation of the line, that is, between the interval of the points **0** and **1**. A fraction of the line denies being the line, since it is only a part of it. Subintervals, in the same way, are also capable of infinite negate themselves, guaranteeing the primordial premise of logic (negation of itself) in the interval and its subintervals.

Probably, these axioms or features of primordial logic (the essence of everything and by consequence of this study) are the foundations of the basic cognitive processes that

have supported and continue to support, for example, the creation and development of numbers. The logic's negations to itself form a logical expansion that represents changes or inequalities. These inequalities (differences) can be represented by symbols of a language, and numbers are a convenient cognitive abstraction for this representation.

The initial, final and intermediate points represented in the straight line in the Figure 1 are consonant with the natural numbers, readjusting the scale of the symbols that represent each logical moment as needed for the expansion. They are also consonant with positive real numbers, those represented without operations, such as fractions, roots and others (finite decimals).

Figure 2 – First logical moment

Fractionated line in two intervals representing the first logical moment.

In Figure 2 the joining of the dash to the straight line is the representation of a logical negation (logical moment). From the negation of the logic in [be] arise these two logical subintervals or two sublogics (intervals of the straight line). In this first logical moment, the segment in blue represents the negation of the logic in [be] the illogical whole (the straight line). In the second logical moment, the two subintervals of the straight line or sublogic are able to negate themselves, guaranteeing the primary premise of logic, [NOT BE] infinitely. In Figure 3 a logical expansion with the first three logical moments is shown.

The logical essence [NOT BEING] is analogous to an abstract constant, that is, its infinite negations and subnegations transcend time. All these infinite negations take place in the absence of time. The inability of logic to negates itself, even for a small interval, would make logic [be] illogical in that interval, which would break the primordial premise of logic, [NOT BEING]. Logic is like an algorithm composed only of a self-executing constant, a generalized recursion and infinite.

It is simpler to visualize this generalized and infinite recursion by imagining a horizontal bar in black ██████████████████████████. This bar is formed by infinite black vertical slices or lines. So there are infinite ways to negate the first logical moment and each infinitesimal slice of the bar will be the beginning of a different sequence or expansion. When determining any of the slices for the first logical moment, immediately all other slices of the population (in the left and right ranges of the chosen slice) are different expansions for the second logical moment, and so on. In other words, expansions are generalizations, and there is no slash range that has not already been negated for any logical moment.

This generalized infinite recursion in the absence of time is the best definition of a constant, the best definition of constant, which according to the English online dictionary Collins(CONSTANT. . . , 2021), is something that repeats itself continuously, uninterruptedly and permanently, something unalterable.

The experience of time is conducted by the consciousness, a specific and non-generalized expansion. Time is not a quantity related to the simultaneous nature of this generalized and infinite recursion, but rather by the order or sequence of each specific expansion, which is nothing more than the observation of the order of the changes of each logical moment of the expansion. **This order of each logical moment only makes sense in**

particular expansions, because when generalized the primordial logic <u>NOT BE</u> is a transcendent constant that mirrors or represents the infinite possibilities of a probabilistic n x n matrix. The Time subsection shows more details in this regard.

1.1 Logical expansion

Primordial logic (negation of self) creates infinite logical expansions. A logical expansion is analogous to a universe. The first logical moment is the beginning of one of these expansions, but there are infinite possibilities of negation of the first logical moment, which reveals infinite logical expansions.

Figure 3 – Initial logical moments
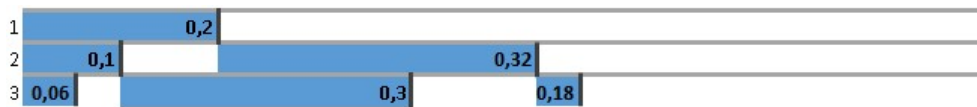
Example of the first three moments of an expansion.

Based on Figure 3, the following observations can be extracted in relation to the first, second and third logical moments:

First logical moment The negation of the primordial logic to itself, subdivides it into two units, two sublogics. Although these parts have different proportions, they express the same amounts of points or possibilities of change, since they are representations of the primordial logic, which *ad infinitum*. The fractional part in blue represents the proportion of the logical negation to its unity.

Second logical moment It is generated by the negation of the two primordial sublogics fractionated in the first logical moment, that is, the second logical moment is a negation of the first. In the impossibility of these sublogics continuing to negate themselves, even for a brief instant, would make them unable to negate their two units of the whole and consequently to make it [be]. The fractional parts in blue represent the proportion of the logical negation to their respective units.

Third logical moment It follows from the negation of the second logical moment, just as the second logical moment follows from the negation of the first, and so on.

With each negation or subnegation of the primordial logic, its new values are influenced by the adjacent values of the previous logical moment. In the figure 4, the primordial logic negates itself by generating the first logical moment with the value [0,2]. In the second logical moment, its subdivisions are contained within the boundary imposed by the value of the first logical moment. The points of the third logical moment, for example, suffer the impositions of the values of the second logical moment, which in turn suffer the imposition of the first. Pascal's triangle has interesting properties about this relationship.

Figure 4 – Logical expansion enforcement
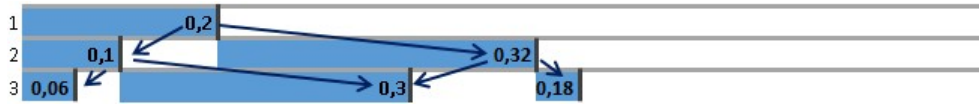
Cumulative imposition on descending logical moments.

In Pascal's triangle, Figure 5a, each number is the closest two numbers above added together. This number represents how many different possible paths lead to it. For example, the number [4] in Figure 5a represents the four different paths leading to it. The binomial coefficients found in Pascal's triangle represent only the amounts of impositions suffered by each value of a logical moment. Another interesting aspect of Pascal's triangle is the Fibonacci sequence, Figure 5b (PIERCE, 2018b).

Figure 5 – Features of Pascal's triangle

(a)   (b)
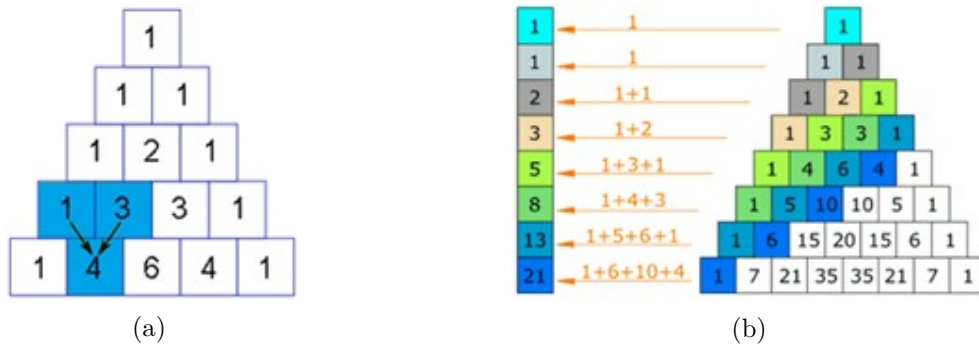
Source: MathsIsFun, 2019. [1]

1.2 Central limit theorem

Based on the axioms seen in Figure 1, the following theorem is discriminated: If the parts of the subintervals are subparts of the entire interval, then these subparts summed are part of the entire interval.

Thus, in Figure 6, the negation of the first logical moment negates [being], while the subnegations of the other logical moments are subparts that subnegate [being], so these subparts only negate [being] when added together or unified according to the first logical moment.

Figure 6 – Subdivided logical moments

Example of the first two moments of an expansion.

In Figure 7 the representation of the first and second logical moments from Figure 6 can be seen as logical units.

Figure 7 – Unified logical moments

Example of the first two unified moments of an expansion.

The dynamics of the theorem described above and its essential axioms of logic are cognitively observable through the mathematical construction of the natural numbers, readjusting the scale of the symbols representing each logical moment as needed by the logical expansion. Mathematics supports the addition operation, necessary in the representation of the above theorem, with Presburguer's arithmetic, which is consistent, complete, and decidable (PRESBURGER..., 2021).

The theorem and its essential axioms of logic can also be cognitively observable by the mathematical construction of positive real numbers (represented without operations such as fractions, roots and others - the finite decimals), which is supported by the mathematical theory of the ordered field - a subset of the real numbers greater than or equal to zero and closed for the sum and product operations. The product operation and its properties are not necessary for the dynamics of the theorem and its essential axioms of logic (ORDERED..., 2021). The ordered field mathematical theory is a first-order mathematical theory, with all its axioms described by first-order logic, making it complete and decidable (REAL..., 2021).

It is important to note that logic in its essence is not subject to mathematics, but all mathematics is restricted to logic, and therefore some of its simplest constructions may come closer to essential logic than others.

The unity present in the negation (first logical moment) and in the logical subnegations (other logical moments) is the characteristic that corresponds to the central axis of the central limit theorem. This theorem states that the sample distribution of a population approaches a normal distribution as the sample sizes increase, regardless of the shape of the population distribution. This is especially true for sample sizes greater than 30. A simple test that demonstrates this fact is the rolling of unbiased dice. The higher the dice roll number, the more likely the graph will look like the normal distribution graph (GLEN, 2019). The appendix A explains the Distribution_PROB algorithm in order to clarify the probabilistic essence of the central limit theorem.

It is important to note, as shown in Figure 8, that the probabilistic balance or synchronism to the right and left of the median, caused by the distribution of unified logical moments, can illustrate the doctrine of opposites of Heraclitus of Ephesus (GRAHAM, 2021).

Figure 8 – Probabilistic synchronism of the opposite samples with respect to the median

Example of a distribution that approximates the normal distribution.

In the table 1 is the probability of the binomial distribution between 100 and 10000 samples, in line with the unified samples, Figure 7, or sample averages treated in the central limit theorem.

The binomial distribution behaves like the tossing of coins (heads or tails), in the case of the first row of the table, distribution of 100 samples, there are 101 possibilities, from 0 to 100, as if 100 coins were tossed adding their sides up, which can be 0 for heads and 1 for tails, for example. So if all 100 coins tossed come out heads, the sum is 0, and if they all come out tails, the sum is 100. This sum is a combination of possibilities, not a permutation, that is, in permutation [0, 1] is a possibility other than [1, 0], in combination it is 1 possibility, but with 2 probabilities of occurrence. Therefore, the sum corresponding to 100% of the heads or 100% of the tails corresponds to 1 possibility each, while the other sums have a higher possibility of occurrence. For this first row of the table, 100 coins, 99.994% of all possibilities sum between 31 and 70.

The construction of this table was performed with the general binomial probability formula (which represents a uniform distribution) using the algorithm BinomialDistribuion_PROB explained in Appendix A (PIERCE, 2018a).

$$f(k; n, p) = \binom{n}{k} p^k (1-p)^{n-k}$$

The binomial distribution was used in this section of the study, but other discrete distributions could be used, such as the unbiased dice roll, and the observations in this study would remain the same because the central limit theorem is independent of the shape of the population distribution (FROST, 2018).

Table 1 – Probability of binomial distribution

Target	Range Sum	Range		Total Samples	Samples in the Range	% of Samples in the Range	Subset of ≈ 28% of the Range Samples
99,99%	99,994%	31	70	101	39	38%	72,87%
99,99%	99,992%	73	128	201	55	27%	71,11%
99,99%	99,991%	117	184	301	67	22%	72,73%
99,99%	99,990%	162	239	401	77	19%	70,62%
99,99%	99,991%	207	294	501	87	17%	73,64%
99,99%	99,991%	253	348	601	95	15%	72,96%
99,99%	99,991%	299	402	701	103	14%	72,69%
99,99%	99,990%	346	455	801	109	13%	72,69%
99,99%	99,991%	392	509	901	117	12%	72,86%
99,99%	99,991%	439	562	1001	123	12%	73,16%
99,99%	99,991%	486	615	1101	129	11%	73,54%
99,99%	99,991%	533	668	1201	135	11%	71,45%
99,99%	99,991%	580	721	1301	141	10%	72,06%
99,99%	99,990%	628	773	1401	145	10%	72,68%
99,99%	99,991%	675	826	1501	151	10%	73,31%
99,99%	99,990%	723	878	1601	155	9%	71,76%
99,99%	99,991%	770	931	1701	161	9%	72,49%
99,99%	99,990%	818	983	1801	165	9%	73,20%
99,99%	99,990%	866	1035	1901	169	8%	71,90%
99,99%	99,990%	914	1087	2001	173	8%	72,67%
99,99%	99,990%	1394	1607	3001	213	7%	71,86%
99,99%	99,991%	1877	2124	4001	247	6%	72,47%
99,99%	99,990%	2363	2638	5001	275	5%	72,38%
99,99%	99,990%	2850	3151	6001	301	5%	72,75%
99,99%	99,990%	3338	3663	7001	325	4%	72,32%
99,99%	99,990%	3827	4174	8001	347	4%	72,18%
99,99%	99,990%	4316	4685	9001	369	4%	72,23%
99,99%	99,990%	4806	5195	10001	389	3%	72,42%

Table generated by BinomialDistribuion_PROB algorithm with binomial distribution from 100 to 10000. [2]

Target Percentage of samples observed;

Range Sum Percentage that **"Range"** reached **"Target"**, from median to edges;

Range Range of samples where **"Target"** was reached from **"Total Samples"**;

Total Samples Shows the total evaluated range, in the case of the first row of the table the value 101 corresponds to the possibilities from 0 to 100;

Samples in the Range Quantity of samples from **"Range"**;

Percent of Samples in the Range Percentage that **"Range"** represents of **"Total Samples"**;

Subset of ≈ 28% of the Range Samples This range is a subset of **"Range"**, formed from the median, adding 14% to the right and left, totaling 28%. These 28% correspond

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[2] Appendix A is dedicated to clarifying the BinomialDistribuion_PROB algorithm and validating the general binomial probability formula used by it.

to approximately 72% of **"Samples in the Range"**, which in turn correspond to 99.99% of the total population. The remainder, which represent 72% of the size of the **"Range"** correspond to approximately 28% of the samples. This matches the Pareto Principle also known as the 80/20 rule and which can also be 70/30 or 90/10 for example (PARETO..., 2021).

It can be seen in Table 1 that as the samples increase, the percentage occupied by 99.99% of the samples **"% of Samples in the Range"** tends to decrease more and more slowly, although the amount of samples representing this percentage tends to increase **"Samples in the Range"**.

The column of **"Range in the Samples"** from Table 1, blue arrows in the graph of Figure 9, will be getting closer and closer to the center of the graph proportionally. Although the amount of **"Range in the Samples"** increases, the proportion they take in **"Total Samples"** decreases. The purple arrows in the graph represent the column **"Total Samples"** of Table 1.

Figure 9 – Comparison of total samples with a range of 99.99%

The purple arrows represent the "Total Samples" column and the blue arrows the "Range Samples" column of Table 1. [3]

At <https://www.mathsisfun.com/data/quincunx.html> there is a tool called Quincunx or Galton Board that dynamically exemplifies what the above pictures show. An explanation of how this tool works can be found at <https://www.mathsisfun.com/data/quincunx-explained.html>.

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[3] The graph in Figure 9 represents the first 20 rows of Table 1, as they suffer equal increments of 100 samples in each row. Rows 21 onwards are incremented by 1000 samples on each row.

1.3 Consciousness

A logical moment can be formed by a division (first moment) or by logical subdivisions (other moments).
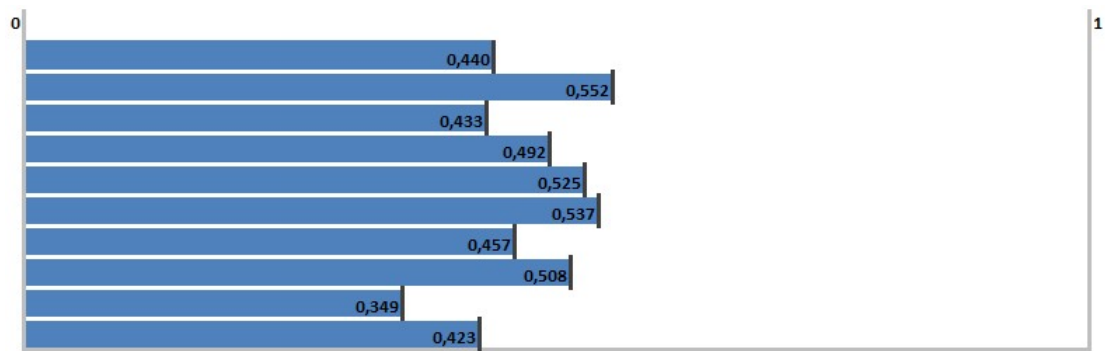
Figure 10 – Logical interval

Example of a logical interval with ten logical moments.

The units of logical moments tend to form the largest and most complex logic in the population, the largest wave, consciousness.

Figure 11 – Conscious logical interval

Example of a conscious logical interval with ten units of logical moments.

It can be seen in Table 1 that the probability of 99.99% of the samples in a population (Range), which increase in quantity as the logical moments increase, tends to be increasingly in the center of the logical interval and this centralization tends to infinity.

Figure 12 – Centralization of 99.99% of the samples
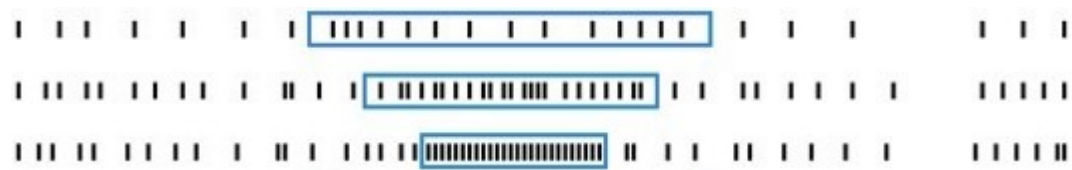
Tendency to center the range of 99.99% of the samples.

Consciousness tends toward the representation of a logical wave, the largest logical wave in a population (a histogram of the normal distribution) as shown in the figure 8. All of the aspects listed below are inherent in the logical abstraction called consciousness.

1.3.1 Infinite

One of the most important aspects that the negation of nothingness brings (negation of self), is infinity, that is, in any logical interval the infinite fits again. The primordial logic that started the entire logical interval is the same found in its subsequent intervals (subintervals). This substantiates how a high-level logic like the human subconscious explains primordial logic, since it is not necessary to go back to the first logical moment of the interval to deduce it, as this phenomenon is omnipresent throughout the interval. This phenomenon can be seen in the subsection on Space, Spatial plane.

1.3.2 Waves

Probabilistically, the distribution of new samples from a population tends to concentrate more samples toward the median of the population as the frequency of samples increases in this direction. However, the distribution of these samples with uniform growth frequencies is infinitesimal compared to the random possibilities of this growth. Thus, the tendency of these growth frequencies toward the median, together with the very low (infinitesimal) probability of this growth being uniform, leads to frequencies in the waveform. The relationship of the density or amplitude of a wave to its length is detailed in the next subsection.

Figure 13 – Waveform
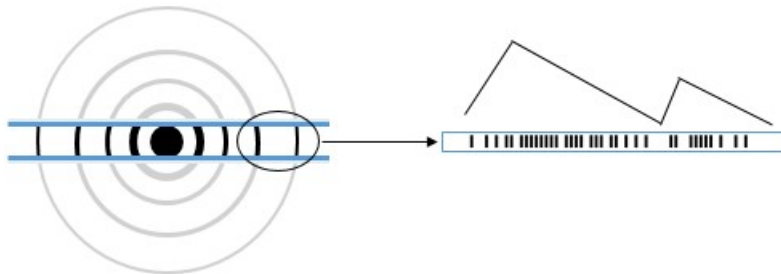
Wave pattern inferred by the trend of this distribution with higher frequencies towards the population median and very low probability of uniform growth of these frequencies.

Merging one wave into another eliminates its discrepancy and makes that wave cease to exist and become part of the first wave, which has its peak closer to the median, in this example. A wave doesn't die, it just merges with another wave closer to it.

Figure 14 – Wave unification

Waves being unified to exemplify the uniform growth of the samples.

1.3.2.1 Wavelength and amplitude

The histogram is used in the figures in this subsection and later to facilitate visualization and understanding of the distribution of samples in a population, because it represents very well the density curves of a population, according to the different views of the Figure 15, representing only one interval or wavelength paired by the median of the population.

Figure 15 – Histogram in different views

Different ways of population representation in a histogram.

The length and amplitude of waves establish a quantity-per-interval or unit relationship. These units are established by wave entanglement, as seen in the next subsection. Thus, amplitude is the density of a wavelength, the density of some interval.

When adding a new sample to the population, the entire interval is proportionally distributed to match that sample, as shown in Figure 16.

Figure 16 – Interval expansion

Expanding the interval by adding new samples.

In large intervals with many logical moments, a smaller proportional discrepancy of wave amplitudes is observed. This characteristic is related to the larger number of logical moments and possible subintervals that can more easily compensate and neutralize the probabilistic unevenness of the interval. The larger the intervals, the more balanced they grow towards the population median (probabilistically) as seen in Figure 17. More complex intervals with this feature can represent, for example, the universe, then galaxies, stars, planets, etc.

Figure 17 – Wave amplitude at large intervals or lengths

Smaller wave discrepancy at large intervals.

At smaller intervals and with many logical moments, a greater proportional discrepancy of wave amplitudes is observed. In these intervals smaller object systems can be observed. The smaller the intervals are, the more unbalanced they will grow towards the population median (probabilistically) as seen in the figure 18. More complex wave systems with this feature can represent, for example, the atom, which is very small, present in huge quantities, and the particles orbiting its nucleus (electrons) are much more distant from it. This greater discrepancy is strictly linked to the reduced size of these intervals, making them receive these new samples in a less uniform and unbalanced way, which makes the follow-up of their subintervals to their peak or to their reference line less accurate (the spiral becomes wider, elongated and misshapen due to less uniformity in its correction frequency). Spiral and orbits can be seen in more detail in the subsection on Spiral and orbit.

Figure 18 – Wave amplitude at small intervals or lengths
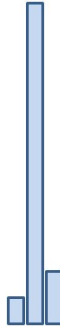
High wave discrepancy at small intervals.

1.3.2.2 Entanglement

The most similar samples in terms of frequency and distribution are the samples that are part of the same wave. They are non-overlapping, opposite frequencies that complete each other.

Probabilistically, the two complementary parts of a wave tend to be at approximately equal distances, equidistant from the median, but this is not a rule and the complementary parts of a wave may be at different distances from the median. The phenomenon of parity of the parts of a wave is called wave entanglement.

These pairs are formed by the probability distribution of the population and are part of the same probabilistic unit.

These probabilistic units form smaller waves (subconsciousnesses), similar to the largest wave in the entire interval, usually entangled by the population median (consciousness). Consciousness is the logic of the entire interval, while it forms subconsciousnesses or sublogics, like small waves of a larger wave. These small waves are similar to the pattern of the larger wave.

Figure 19 – Subconsciousness
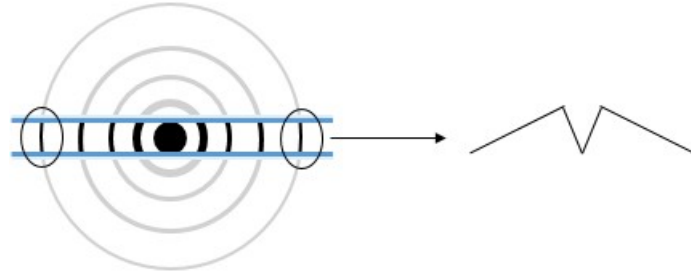
The wave pattern forms subconsciousnesses similar to the pattern created by consciousness, as seen in Figure 8.

The entanglement of waves can occur at different levels or intervals, as seen in Figure 20, which forms nested wave systems. The borderless braces (right) identify the intervals at which a new sample triggered the jump, as seen in the next subsection. The numbered arcs indicate the order of the entanglements. An entanglement can occur equidistantly from the median without the jump, like the first entanglement (violet).

The largest entanglement is shown in the examples in Figure 20 as the first entanglement (violet), which occurred when that interval was the smallest, probably. Large intervals tend to be kept ordered by the reordering of their subintervals subsequently. The largest wave is commonly entangled by the population median.

Figure 20 – Wave entanglement levels - wavelengths
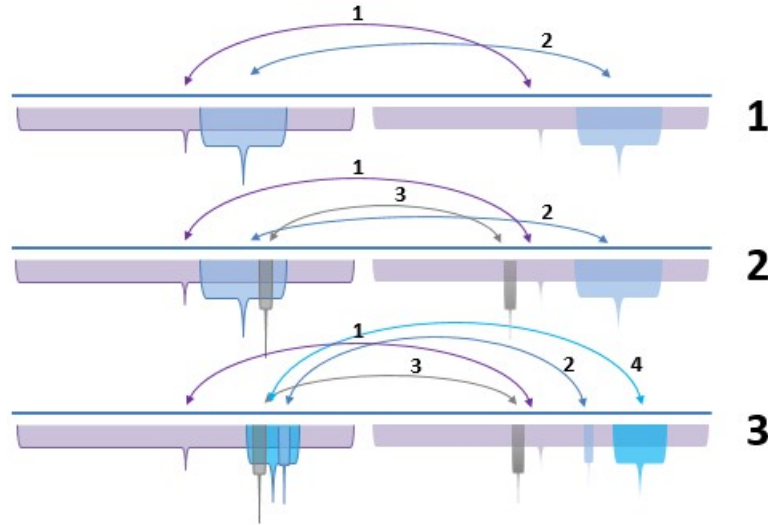
Examples of entanglement levels of waves or levels of wavelengths.

If several intervals are part of the same population discrepancy, of the same wave, then these are subintervals of a larger interval, of a larger wave.

The possible wavelengths of a population are defined by these levels of wave entanglement. Thus, regardless of the order of the jumps, larger entanglements are the longer wavelengths and smaller entanglements are the shorter wavelengths, which allows larger waves to have smaller subwaves.

A superior interval can change its entangled pair (the remaining samples that are not part of its subintervals) without affecting its subintervals, that is, each interval or subinterval has its best matching pair independently. This is an extraordinary condition because of the similarity conditions required for entanglement.

Larger waves are formed by adding their new samples, and can form new subintervals. The meeting or separation of two entanglements does not entail a new entanglement. Thus, larger waves are also formed through the inclusion (vigor of entanglement) of smaller waves already entangled when the areas of these waves are partially or totally overlapping.

NOTHING NOT BEING is synonymous with movement, with change, as presented in the opening section of this article, Logic. In this way, movement is the signature of an interval. This signature corresponds to the distribution of samples within the interval, as per the Space subsection. Intervals with similar signatures tend to have similar motions and speeds, tend to be at the same discrepancy as a larger wave. This characteristic differentiates one interval from another, in other words, it discriminates discrepancies in a population.

Virtual intervals are non-entangled intervals, which usually form virtual clouds. These virtual clouds are sets of virtual intervals that exchange their entangled pairs constantly. These virtual intervals move according to the spatial dimensions of their side of the pair, best visualized in the Space subsection. An interval that has lost its entanglement, resulting in a virtual interval, will continue its trajectory until it entangles again, eventually with a jump. Virtual intervals can grow and stabilize to become a non-virtual interval.

The vigor of an entanglement is the number of subintervals that one wave has entangled with another. Vigor is total when a subinterval (which is also a wave) has entangled all its subintervals within its superior wave, that is, all its subintervals are fractions of its superior interval. Total vigor occurs more easily when the waves of a system are born with the system, so the greater the interval, the greater the number of possible subintervals and the greater the chances of them becoming entangled with each other, due to the probabilistic distribution of the population (the samples are predisposed yet random), which makes these intervals more and more stable as they grow. It is also possible to have total vigor when one interval converges with another and remain that way for a period in which its subintervals are influenced by the peak of the system, to the point that their entangled pairs are within the same population discrepancy even though they were not born of this population discrepancy to which they came to belong. The amount of subintervals that a wave is constantly sharing with another wave is what guarantees a greater or lesser synchronism of the movements of these waves, according to the subsection of Space. This sharing can occur with already entangled subintervals or with unentangled subintervals, usually part of a virtual cloud. This sharing can also occur on only one side of the entangled pair, as in the case of waves of the same level.

As an example of partial vigor, the entanglement of waves or larger parts of a car (car parts) can occur with greater to lesser vigor, such as the fusion of parts or welding, glues, something more elastic, among others. Thus, the engine and wheels of a car when accelerating and braking respectively, equally accelerate and decelerate its entangled parts. The less vigorous the entanglements, the more the parts suffer from inertia, such as loose objects and occupants inside a vehicle. Another example of the partial vigor of entanglement can be seen in molecular bonding.

As an example of total vigor are galactic, stellar, and nuclear systems, the latter being less stable due to its small size. However, all these systems have a high level of synchronism in their motions, better explained in the Space subsection.

1.3.2.3   Jump

In Figure 21 a new entanglement of already entangled intervals is observed (represented by columns of a histogram to facilitate the visualization of the interval). This new entanglement occurs as the samples of the entangled pairs are no longer equivalent with the addition of new samples on one side of the pair.

Figure 21 – New entanglement
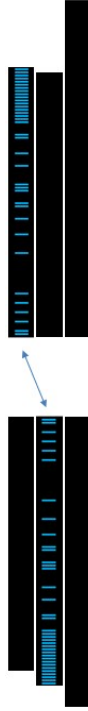
New entanglement caused by the non-equivalence of the entangled pair with the addition of new samples on one of its sides.

Jumping occurs when an interval entangles with a virtual interval (non-entangled interval). In this case, the entangled interval appeared in one region and when entangled again with another virtual interval, it appeared in another.

As an example, a photon entering the electron's interval can unbalance one side of the electron's entangled pair, which makes it jump, but since the electron's interval is small and the photon is fast (because it is even smaller) it quickly leaves the electron's interval, which becomes unbalanced again and returns to the energy level equivalent to the one before the jump.

1.3.3 Time

Time only makes sense when observed in a specific population expansion (partially), when observed in its entirety it is a transcendent constant that mirrors a probabilistic matrix of infinite possibilities.

1.3.3.1 Integral

In the initial section Logic (the genitor section of all the others in this article) it was presented that logic is a sequence of negations of itself at time zero, that is, at no point between its negations does logic go to <u>BEING</u>, guaranteeing the primordial premise of the logic constant, <u>NOT BEING</u>. When the expansion is generalized each logical moment is in infinitely different orders within the infinite population expansions of this constant, that is, the primordial logical <u>NOT BEING</u> is similar to a probabilistic n x n matrix when generalized, it is a transcendent constant that mirrors or represents these

infinite possibilities. In this way, the order of each logical moment only makes sense in the expansion of a specific population. In the observer-driven experience of time, the ordering of each sequence is the essence of this logical quantity and therefore more relevant than its origin, which is of a simultaneous nature, transcending time.

1.3.3.2   Partial

Time is the addition of new logical moments between existing moments as the self-negation of primordial logic proceeds. The changes are cumulative and as the number of logical moments increases, the less relevant each new moment within the conscious interval will be. One in a hundred is more relevant than one in a thousand.

Figure 22 – Time
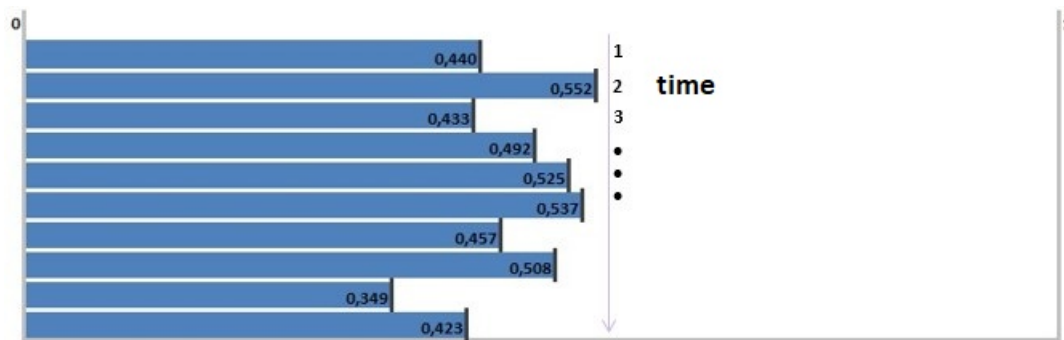
Progression of time as logical moments advance.

Time also passes in intervals when they converge with other intervals and are able to interact by colliding or entangling their sub-intervals, according to the next subsection of Space.

Each population has a different order in its sequence and it is this order that gives rise to the logical quantity called time. It is this order of the universe or of consciousness that will give the notion of what happens before or after, that is, the past, the present and the probabilistic future prospections.

Temporal flows of a population can have the same beginning and even the same temporal expansion, infinitely, from the first negation of the expansion. Thus, there are infinite temporal flows in the same population expansion at different points in it, as the highlighted expansion in Figure 23. Therefore, it makes no sense to associate the number of samples or the age of the temporal flow of a particular universe with the age of the logical constant <u>NOT BEING</u>, which precedes time. Motion, change or time are smaller versions of what is constant and total.

Figure 23 – Logical constant - population time flows

Another important factor when observing time (the observer is more detailed in the consciousness subsection – Observer and life) is that, probabilistically, subconsciousnesses or intervals closer to the population median will have a larger addition of new samples in their intervals, which are directly observed by these subconsciousnesses. On the other hand, subconsciousnesses far from the population median will have a smaller addition of samples in their intervals and are subject to a larger number of indirectly induced changes, as detailed in the next subsection of Space and that can also be seen in Figure 16. This phenomenon of temporal observation provided by the probability of the population distribution avoids the twin paradox (PERKOWITZ, 2013).

When the gravitational attraction is stronger the samples are more intensely distributed in this gravitational direction, which to some extent opposes a looser movement in other directions or orbits. This characteristic may influence the movement of atomic clocks, which may have a more uniform movement in environments with low gravity.

Prospections of the observer's future are based on the probabilistic distribution of the population and, therefore, on the probabilistic distribution of each sub-interval of the population. The universe tends to be probabilistic, while random at levels of detail (which makes events different), yet predictable at some level, as shown in Figures 10 and 11.

1.3.4 Space

Time and space come from the same population samples. Time is related to the order of each sample, while space deals with their disposition in the population at each new order.

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[4] <https://twitter.com/akiyoshikitaoka/status/851375952051421184>

1.3.4.1 Spatial plane

The spatial plane is the representation of the infinite, of the <u>NOT BEING</u> in all its possibilities and from which the space-time flows emerge as its possibilities. That is, it is the representation of NOTHING, the void that mirrors or represents all possibilities and it is present at all scales between any spatial and temporal possibility. This plane also emerges within the scales of thought, where the exercises of prospections (future possibilities) emerge from the probabilities of a determined interval with this plane or logical flow of infinite possibilities. So, when thinking about NOTHING naturally this logical representation of empty and infinite space emerges.

The spatial plane is logical and flat even though your samples tend, probabilistically, towards the reference line of the largest wave, which tends to be separated by the population median.

Figure 24 – Flat universe
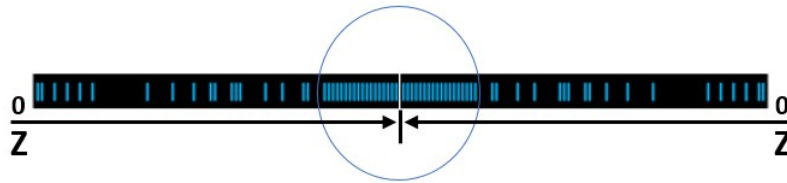
Concentration of 99% of samples.

1.3.4.2 Dimensions

NOTHING <u>NOT BEING</u> is synonymous with movement, with change, as presented in the opening section of this article, Logic. In this way, as shown in Figure 24, the Z is the representation of the number of samples of a wave. Therefore, Z is the representation of entanglements, which is the only authentic and genuine dimension (the essence of spatial dimensions), being the main direction of movement. As the amount of samples only increases (the same reason that makes time only flow in one direction), the intervals will also move in that predominant direction, which in this case is up. The X and Y are just subdimensions that represent the density, the peak, on each side of the entangled pair respectively, that is, they manifest the different ways that Z rises (quantity), and X and Y (density) can be anywhere (left, right, centered, etc.) within each side of the entangled pair. These movements are more detailed in Figure 26. Later the X, Y and Z will be treated as dimensions to facilitate understanding.

It is easier to understand the entanglement when looking at Figure 25. In part (A) of the Figure, it is shown how each side of the pair behaves in their respective dimensions and subdimensions, in parallel. It is easy to see that intervals with similar movements will meet and the parts of these intervals and subintervals that correspond on each side of the pair become entangled, like the overlapping area of the ellipse in part (B).

Figure 25 – The movements of the pairs and the encounter - entanglement
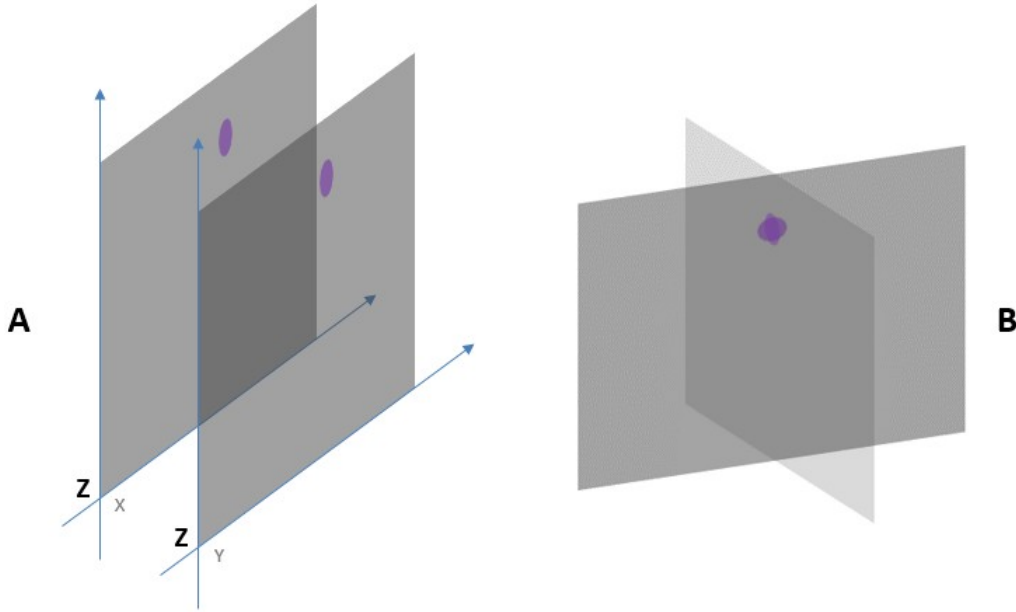
Movements in the respective dimensions and subdimensions of each side of the pair underlies the entanglement.

When a human being moves, goes from one point to another and returns (zigzag), or any other movement, he is making a movement similar to a spiral. Observing the movement as a whole, the human being is also moving through the planet, solar system, galaxy, etc. No matter what dimensions the movement used, probabilistically, the movements tend to be smooth, no matter how abrupt they seem locally (left or right, up or down, front or back). Movements tend to be a variation of the Spiral, as per the subsection on Spiral and orbit.

1.3.4.3 Movement

Each new sample is time and also space (motion and change). Movement is a signature of an interval and that signature corresponds with the distribution of samples within the interval. A subinterval, which does not contain a subinterval as in Figure 26, can be born anywhere. These virtual intervals move according to the spatial dimensions of their side of the pair when not entangled and with the dimensions of both sides of the pair when entangled. In Figure 26, an interval is shown that does not yet contain subintervals, so its rise will either be centralized if its samples are evenly distributed or with a centralized peak, or it will be skewed to the right or left as the higher concentration of samples is on one side (it is more common for the concentration of samples to be towards the median of the population). In the virtual interval the dimensions are Z (to go up) and X or Y, depending on the side of the pair, for the sample density of the non-entangled interval. In the tangled interval the analogy is the same as in the virtual interval, but the dimensions are Z (to go up on both sides of the pair), X and Y for the sample density of the interval on each side of the tangled pair. A non-rarefied environment can hinder these movements because of collisions.

Figure 26 – Interval without subintervals
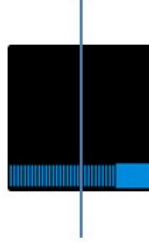
Moving an interval without subintervals.

Theoretically, the maximum speed is 1 unit of space per 1 unit of time, that is, intervals move at a speed lower than 1 unit of space per 1 unit of time. It's not because you have more samples that you have more speed. If an interval has 2 samples to the right, for example, it will move approximately 2 space units per 1 time unit, that is, approximately 1 space unit for each sample. Thus, an interval has a speed limit of 1 space unit per sample per 1 time unit. The fastest interval, hypothetically, would be the interval with a single sample totally centralized or totally to the right or left of the interval, so this interval would reach the maximum speed, but there will always be an even more centralized sample, to the right or left of an infinite interval, according to the interval characteristics shown in Figure 1.

The speed of an interval is not directly related to the number of samples, but to the proportion of distribution of these samples. The more disproportionately distributed an interval is, the more concentrated its peak can be, the faster the interval will be, regardless of direction. Therefore, both smaller and larger intervals can have high velocities, and extremely large intervals have greater ease in concentrating the peak, increasing its disproportion.

A subinterval that is born within its upper interval is born fully synchronized with this upper interval, that is, the samples of the subintervals are also samples of the upper interval, they are shared samples, according to the vigor of their entanglements, as seen in the subsection of Entanglement. In Figure 27, the sum of the motions of the subintervals of a higher interval moves that interval with a given direction and speed, which also carries with it those smaller subintervals that are part of it, even though these subintervals may diverge and leave the higher interval at a given moment. In this way, the movements of the smaller waves were the movement of the largest wave of the population, where its direction and speed are predominantly of the majority, usually the peak, notwithstanding the movement of the minorities. And like a block, the movement of the largest wave leads to the smaller ones, which are parts of it, even though some of these smaller waves have their own movement and can escape at a given moment by divergence in their directions from the direction of the majority.

Figure 27 – Spatial distribution and movement
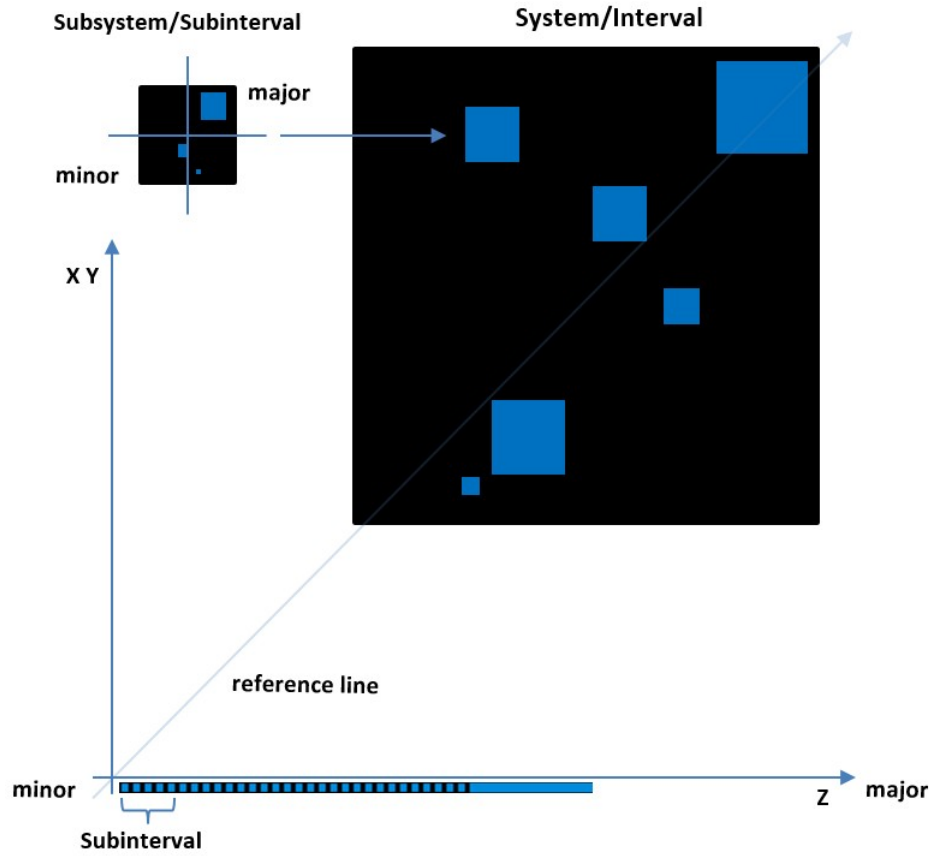
Spatial distribution and movement of subintervals and population interval.

Intervals that have subintervals can move in any direction, since their intervals that don't have subintervals, as in Figure 26, can tangle anywhere and thus this interval can have a distribution of subintervals in any direction, according to Figure 27. The situation in which an interval goes down (Z dimension) is very rare, even rarer when the interval grows, and this situation tends to be very transient.

The interval and its subintervals have their cubical representations with their sizes referring to the amount of samples they have, Z-axis of Figure 27, the fundamental and genuine spatial dimension. An important feature regarding the size of intervals and subintervals can be seen in Figure 40 of the subsection of Black hole.

An untangled subinterval only influences and is influenced by an upper interval when it is within and sharing samples with it, that is, it comes from the same population position as the upper interval, or similar when it has nested subintervals to share with the upper interval. In the same way and consequently, an entangled subinterval only influences and is influenced when within the interval of which it is a part, of which it is entangled. A subinterval, including a virtual one, may be within an upper interval and not share any sample with this upper interval, this is because its internal distribution of samples is completely different from the upper interval, that is, they come from different positions in the population and do not share the same sample distribution.

As an example, it is possible to imagine a passenger inside a vehicle floating in

space. The movement of the vehicle can drag the passenger, even if it suffers from an initial inertia, which can be minimal, even zero, or undo the synchronism, depending on the intensity or vigor of the entanglements and the acceleration of the vehicle, and may even take the passenger out of the vehicle. The passenger's inertia is lower the more entangled to the vehicle he is, such as feet on the floor, hands gripped and sitting in a seat with a backrest, for example, according to the vigor of entanglement explained in the subsection of Entanglement. The vehicle speed imposed on passengers by entanglement (drag that is strongest when accelerating and imperceptible when stabilizing or synchronizing) may be slightly different from the speeds of the passengers who may be zigzagging inside the vehicle, for example, at speeds distinct from each other and distinct from the vehicle speed. The movement of the passenger inside the vehicle can also influence the angle and movement of the vehicle and if this movement is not compatible with the movement of the vehicle the passenger can leave it. Therefore, if the movements coincide or vary within the limits of the entanglements of each interval, the synchronism is maintained. The same happens with the other systems, even more accentuated, in the subintervals that are born within the system or are in it for enough time, in which the peak can totally influence the distribution and density of the samples of these subintervals, reflecting in their movements and speeds, therefore, reflecting on the synchronism, according to the Orbits subsection. Distance is not a requirement of entanglement, so it is not unique to close intervals.

In Figure 28, in examples A, B and C the movement of matter intervals is exemplified and in example D the antimatter. Like ordinary matter, the subintervals of an antimatter interval must also be composed mostly of antimatter. Antimatter is detailed in the Antimatter subsection.

Figure 28 – Motion - matter and antimatter
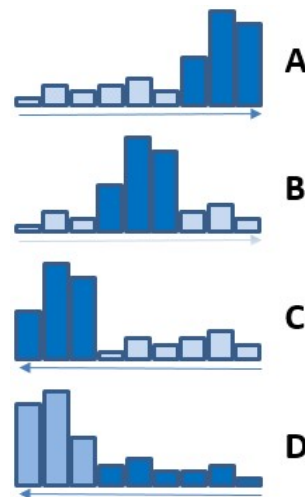
Movements of matter and antimatter.

In example A, in Figure 28, the peak of the interval is to its right, which causes a higher velocity towards the population median. In example B, the peak is centered in the interval, however its samples are slightly more concentrated towards the population median, which causes a lower velocity in this direction and depending on the observer's point of view, this interval may appear to be going backwards. In example C, the peak of the interval is to its left, which causes a higher velocity as opposed to the population

median and is more common in small intervals, however, the subintervals in dark blue (the peak), because they have more samples, tend to have their samples more easily towards the median and may move forward faster than the other subintervals, stabilizing the interval with the peak in the center or more to the right. Example D is similar to C, but the growth of the subintervals of this example are clearly in the opposite direction of the median of the population representing antimatter.

In Figure 29, an example of the sample density of a population is shown, where pairs tending to the same probabilistic distribution are placed side by side and represented in histogram form. The formation of these pairs comes from wave entanglement.

Figure 29 – Entangled pairs represented in three spatial dimensions
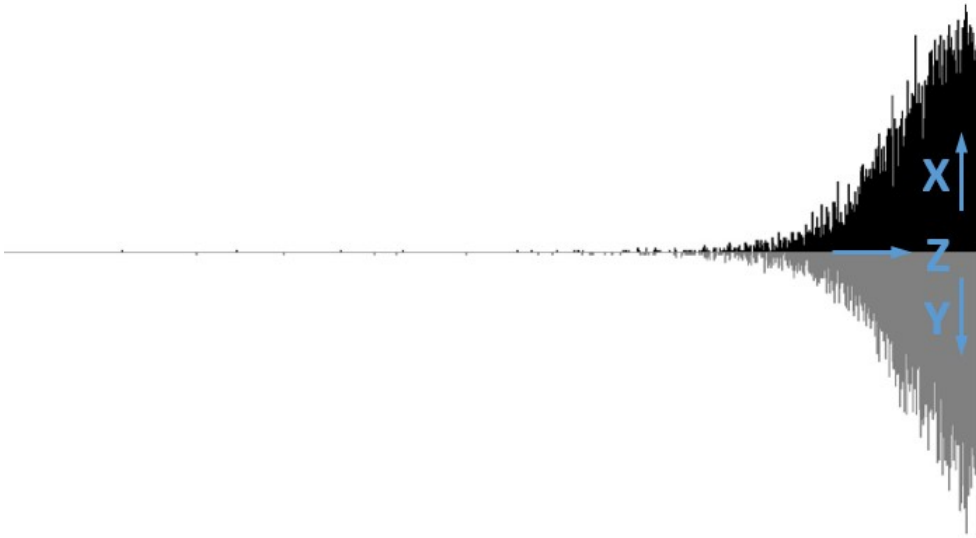
Example of entangled waves, represented in histogram form and obtained by the Logic_WavePattern algorithm. [5]

By plotting the spatial dimensions of the graph of Figure 29 on a 3D distribution graph and distributing their endpoints (neglecting their volumes and possible internal points), something like a spiral is obtained (like eddies in water or air), even on very small data volumes (few logical moments), as in Figures 30a and 30b. The points tend to move in a spiral shape approximately, as shown in the next subsection.

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[5]   The Logic_WavePattern algorithm can be seen in Appendix A.

Figure 30 – 3D scatter plots generated with points similar to Figure 29
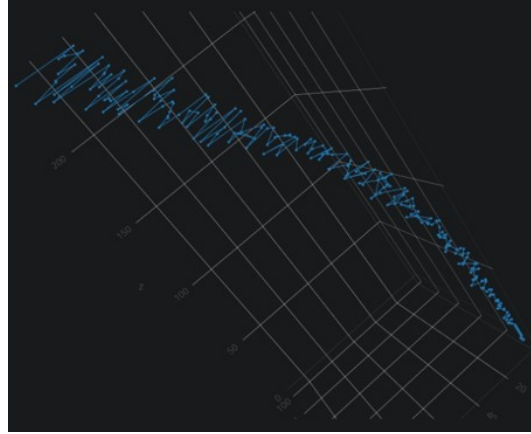
(a) 15,000 samples or moments
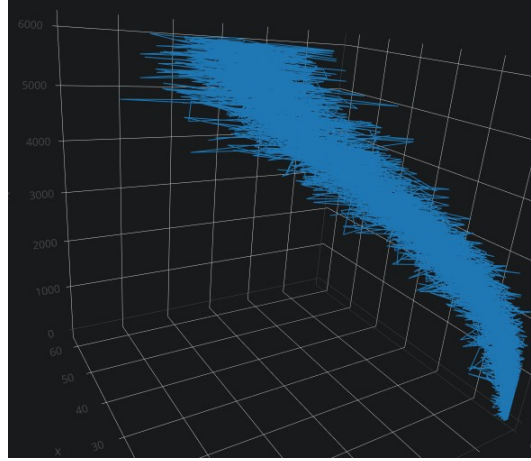
(b) 200,000 samples or moments

The histogram on the wave pattern and the data for generating the 3D scatter plots can be obtained by running the Logic_WavePattern algorithm. [6]

1.3.5 Fundamental forces

The gravitational force, the electromagnetic force and the nuclear force correspond to the so-called fundamental forces of nature. These fundamental forces are not forces as such, but probabilistic aspects of population distribution and wave entanglement.

1.3.5.1 Gravitational force

The gravitational force is not a force itself, but an aspect of the probability of distributing new samples towards the population median, according to the central limit theorem. This probabilistic sense makes waves have a probable path to follow within the population, that is, the peak of population samples or the peak of the largest wave in

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[6] The Logic_WavePattern algorithm can be seen in Appendix A and the 3D scatter plots can be accessed at: <https://chart-studio.plot.ly/create/?fid=ren.stuchi:5&fid=ren.stuchi:4> e <https://chart-studio.plot.ly/create/?fid=ren.stuchi:7&fid=ren.stuchi:6>

the population. In the same way, they also make the samples within an interval have a probable path to follow, the peak of samples of the interval or the peak of the wave. These sample peaks are usually the most easily observable part of the sample interval since they occupy a not so small area.

In Figure 31 it can be seen that the most easily observable part is slightly to the right at the peak of the wave. This wave tends to move up and to the right, in a diagonal direction to the peak of its upper interval.

Figure 31 – Gravitational force
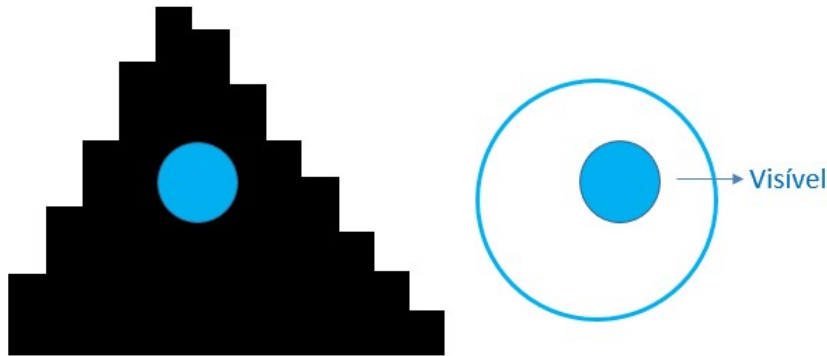
Gravitational aspect - the probabilistic direction of the distribution of new samples within an interval.

The area of an interval grows quadratically, since the jump caused by the entanglement of the waves and the probability distribution of the samples tends to maintain an equivalent growth in the pairs that form a wave. This aspect configures the inverse square law, where, in the case of gravity, the closer the objects, the greater the probabilistic chances of new samples of the smaller object heading towards the larger object (since the larger object tends to be the peak of wave - the probabilistic direction within the wave). Thus, for being within a smaller square area and, consequently, having less possibility of movement, it ends up increasing the chances of these objects approaching with a much smaller amount of logical moments. On the other hand, the more distant the objects, the larger the area, the greater the positioning possibilities and the more logical moments are needed for the approach, featuring less attraction. Probability can also drive away more rarefied objects that should be further away from the denser and more easily observable part of a wave, as in the case of helium gas, for example. The distribution of new samples in the rarefied intervals is slower than in the denser intervals (otherwise they would not be rarefied), so these dense particles receive more samples in a shorter amount of time, occupying the front of the less dense particles.

1.3.5.2 Electromagnetic force

The electromagnetic force is not a force in itself, but an aspect of the entanglement of waves that intensifies at intervals or wavelengths with low entropy and with the spatial approximation (reduction of differences in the X, Y and Z axes) of these intervals.

When intervals have low entropy, the total or partial overlapping of their areas facilitates the reordering of their entangled pairs, and an example of this can be the overlapping of an electron's area with the photonic clouds of other electrons or atoms. This reordering is an attempt to equalize these waves into a single low-entropy wave, which also

makes it feasible to exchange many of these pairs for those of the non-entangled virtual cloud (virtual cloud of non-entangled samples, usually around the peak of the interval or subintervals, according to the subsection of Entanglement), which may result in the approximation of these waves due to this reordering.

The blue lines in the figure 32 show where the exchange of wave pairs by wave entanglement is most frequent, that is, where the waves are most probable to be similar. This is why magnets try to rotate to connect when they are face to face with the same pole. The gray line shows connections that occur in a much smaller number.

Figure 32 – Electromagnetic force
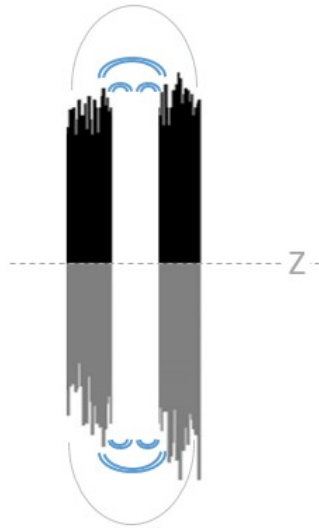
Increased possibilities of wave entanglement due to probabilistic equalization in close and low entropy objects.

Figure 33 shows an example of low entropy.

Figure 33 – Electromagnetic force - entropy
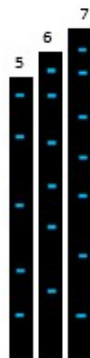
Increased possibilities for wave entanglement due to low entropy.

The electromagnetic aspect is closely related to the low entropy of an interval and the possibility of entanglement of its pairs with surrounding pairs. The low entropy of an interval indicates that its samples are in some sort of order within it.

Probabilistically, the most similar wave pairs are found in the closest regions (blue lines in the figure 32). This occurs due to the growth of the number of samples towards the median of the population, however it is not a rule and the poles may reverse, that is, have more connections with the region of lower probability, even though most of the pairs that make up this region are increasing towards the median.

1.3.5.3 Nuclear force

The same probabilistic aspects that govern gravity and that can be seen in Figure 31 also govern the so-called nuclear forces. The difference is that in nuclear forces the intervals are smaller allowing a much larger amount of jumps and their waves are more discrepant, as shown in Figure 18.

The strong and weak nuclear forces represent large concentrations of logic moments per population interval, a high density in a small interval. The large concentration of these samples is at the peak of the interval, which occupies a smaller and smaller subinterval within the wave (proportionately), due to the high concentration of samples in smaller and smaller intervals, as shown in Figure 9.

It is important to note in relation to the movements of electrons and atomic nuclei, as seen in the subsection of Orbits, that the atomic nucleus is moving as fast in space as all its higher waves. Star systems are at the same speed as their galaxies among others, due to the vigor of wave entanglement at all levels of entanglement, as per the subsection of Entanglement, making motion synchronous to a large extent. The nuclei, be they stellar, atomic or any other tend to be faster in space and pull their orbits, shown in the Orbits subsection. This synchronized and rapid movement in one direction of space does not cause repulsion.

The nucleus is a subinterval of the atomic interval (the wave peak). Electrons are also subintervals of the atomic interval, despite the high discrepancy between the atomic nucleus and its electrons. This discrepancy is common in small intervals such as the atomic one, as shown in Figure 18, which tends to accentuate even more the discrepancy between the peak and the rest of the wave. However, in the subintervals of the peak or nucleus, this discrepancy is smaller because they are much denser than the electrons and are within the same probability distribution, approximately 99% of the samples in the interval. Another factor that makes the discrepancy of the peak subintervals decrease even more is the abundance of these subintervals, so they tend to exchange subintervals with other atomic nuclei and fine-tune their sample distributions even more (movement and velocity, according to the corresponding ellipses in Figure 25). Because they are close and with this greater correspondence, it increases the chances that they share more nested subintervals with each other, increasing the vigor between these subintervals of the same nucleus, which increases the correspondence of the movements between them, facilitating the approximation. In this way, it is easy to see that even in intervals with total vigor (where all the entangled subintervals are inside its upper interval) its subintervals are more or less separable as they are more or less entangled with each other (when the entanglement occurs in only one side of the pair because they are on the same level, according to the subsection of Entanglement).

Another important factor is that in smaller sample intervals, such as the nested subintervals of the atomic nucleus, it may be more common for them to behave like waves

or more or less dense clouds, without a defined and visible peak, due to the tendency for their discrepancies to be larger as the subintervals decrease.

The penetration of these small and dense intervals by an excessive amount of logical moments (another similar interval), in a short period, causes the countless pairs of their subintervals to oscillate, potentiating the jumps. In this way the subintervals jump continuously, progressively and quickly until the probability distribution of the population normalizes the entire interval afterwards. Along with the jumps that will cause movements in large numbers of particles or intervals around them, there are a huge number of frictions at tremendous speeds caused by the collision of these small particles or clouds that cause great shock waves.

Since the subintervals of the atomic nucleus are very close and tuned in their motions and velocities, their entropies tend to be smaller. Therefore, when approaching two peaks with low entropies, the same effect tends to occur when trying to approach two magnets through the same pole, as explained in Figure 32.

1.3.6 Spiral and orbit

As the X, Y, and Z coordinates of the entangled pairs of a population tend to increase, their arrangement in a three-dimensional coordinate system will follow a diagonal reference between these three axes, as shown in Figure 34. The observed spiral pattern does not invalidate other possible movements in space. Often, it is not possible to immediately observe the spiral pattern in the movements of an interval (subinterval), yet this pattern underlies many of these movements. Taking human movements, for example, there are predominant cycles of going and coming home, going to and from work, waking up and sleeping, that is, habits are similar to movements in cycles (spiral movements).

Figure 34 – Three-dimensional coordinate system

Probabilistic reference line for distribution of a population in a three-dimensional plane.

In Figure 34 points X1 and X2 can also be observed. These points were mirrored in X and Y coordinates to facilitate the observation that even at the bottom of the spiral the interval continues to add samples, albeit in smaller amounts than when going up to the top of the spiral. The dashed lines show the most probable paths to the A and B intervals. Thus, when a part of the interval is at its maximum midpoint (X and/or Y axes) the probabilistic tendency is that it receives fewer samples than the part of the interval that is at its minimum midpoint. This spiral effect is more noticeable the larger an interval and its quantity of samples, as the more probable and stable these paths will be.

The continuous motion in a rarefied environment also helps in the formation and maintenance of the spirals. As the samples are added to the subintervals their velocities tend to increase towards the reference line, and because this addition is not uniform (varying between peaks and valleys) and the motion is approximately continuous the subintervals can drift or slide from one side of the reference line to the other.

Each interval or subinterval (wavelength) has its own reference line. Just as within a meter there are centimeters, millimeters, etc., within an interval and subinterval there can be numerous other subintervals.

Figure 35 – Intervals and reference lines
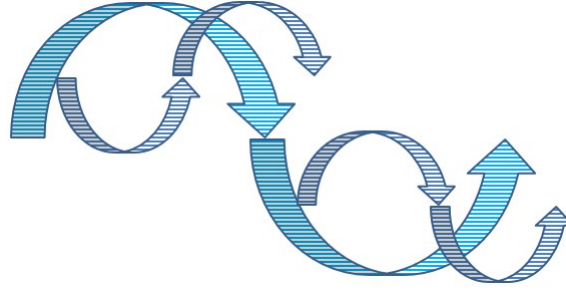
Spirals at different intervals and their reference lines.

1.3.6.1 Orbits

Orbit can be defined in this study as the concept of the spirals plus the orientation of a probabilistic peak (gravity) instead of the reference line of the spirals, only.

Systems that orbit as described earlier (in spiral - oriented by the reference line) are systems or intervals in which their peak is subdivided into subintervals and do not form a center of gravity, that is, all subintervals of the peak are not concentrated in one point of the system, thus orbiting the reference line of the interval. Probably galaxy clusters and superclusters are examples of this orbit. The spiral orbit (oriented by the reference line) is not restricted to large systems, this orbit is a feature that can happen in any size of interval.

Another type of orbit is defined when the subintervals that orbit the peak of the wave (which represents approximately 99.9% of the samples in the interval) decrease their orbit speed as they move away from the peak. In Figure 36 the columns of the histogram in blue represent the peak of the wave. This decrease in velocity occurs gradually as these gray intervals move away from the peak of the wave, thus receiving a smaller amount of samples decreasing their acceleration. The solar system is possibly an example of this type of orbit. Atomic orbits may also resemble this type of orbit due to the differences in energies between the layers structured by the jumps.

Figure 36 – Orbits of the subintervals outside the wave peak
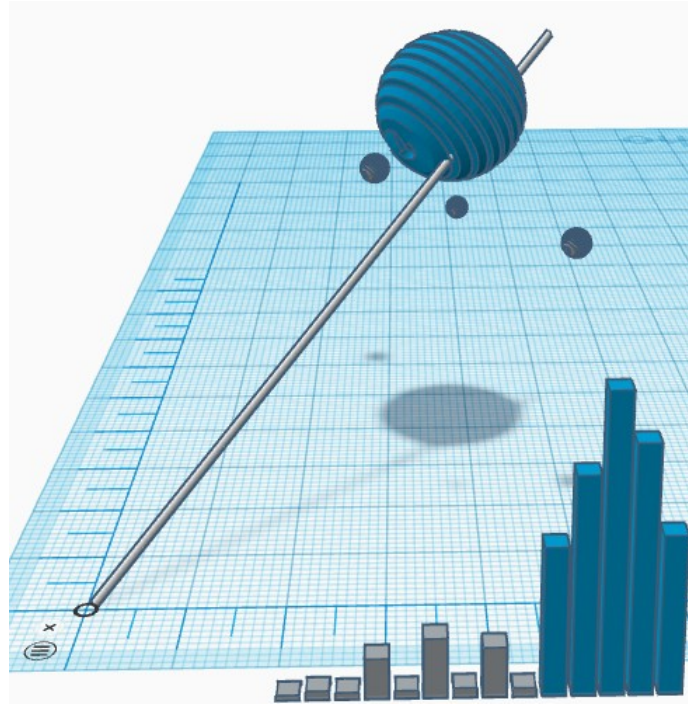
The subintervals decrease in speed as they move away from the peak of the wave.

Yet another type of orbit is defined when the subintervals that orbit the peak of the wave maintain a constant average velocity regardless of the distance from the peak. This occurs because these subintervals are also part of the wave peak in blue, as shown in Figure 37. Thus, because these subintervals remain in orbit within the 99.9% subinterval of the wave, their velocities do not decrease. This 99.9% of the wave is most easily visible part, therefore, the observed part of the galaxies, probably. Perhaps this feature is also responsible for the rings of planets.
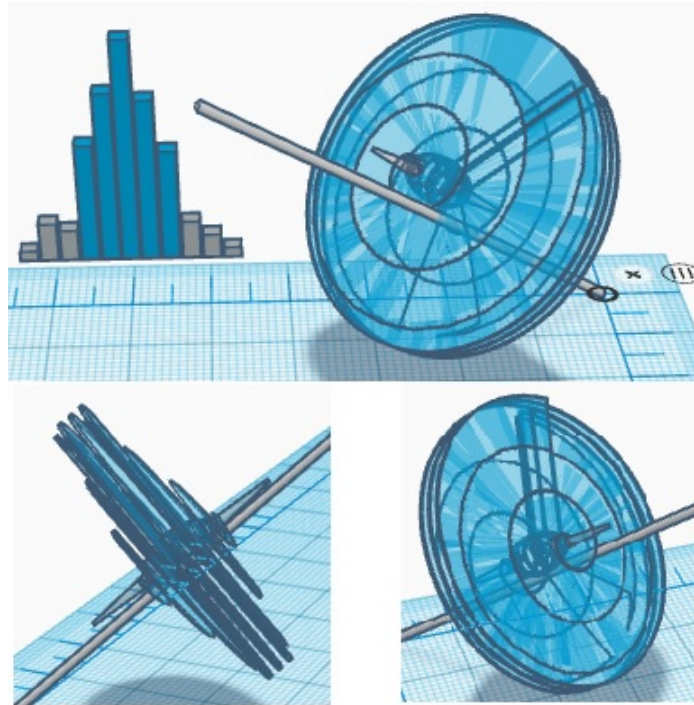
Figure 37 – Orbits of the subintervals inside the wave peak

The subintervals maintain their speed as they move away from the peak of the wave.

For the distance of the subintervals in orbit, gravity exerts more of an orientation than an attraction. But since the motion is practically continuous in rarefied environments and this orientation is permanent, the orbits are formed and maintained by the increasing speed of these subintervals, which tends to pull them apart.

As stated in the subsection of space, a new sample in a subinterval moves it and its upper intervals. Also new samples in the upper interval move the lower intervals, as they are fractions of the same wave. In this way, a lower wave will remain in the upper wave when its velocity is less than the peak velocity of the upper wave and its path is not opposite to the upper wave's path. The movement of the upper wave drags its subintervals, which with lower probabilistic speeds will continue to move within its upper wave, because even with lower speeds they are dragged by the movement of the upper wave, which is also composed of the movement of its subintervals.

Doubling the amount of samples in an interval will not definitely double the speed of an interval, as it have twice as many samples to move, leaving the velocity unchanged. However, probabilistically, the greater the number of samples of a wave, the more these samples will be towards the population median and the less relevant the contrary samples become, which makes the probabilistic speed of wave peaks higher than the speed of their subintervals. This is not a rule and a subinterval may have a velocity greater than the peak of its upper wave or its movement may be contrary to the movement of the peak of the upper wave, causing it to naturally exit the gravitation of its upper wave (and this occurs more easily with very small and fast intervals favored by its movement in a rarefied environment due to its size).

1.3.6.2 Dark matter and dark energy

The intervals naturally move away with increasing speeds because they receive more samples towards the reference line or peak of the wave of their upper intervals and because they move in a rarefied environment.

Spirals can occur without the need for a concentrated wave peak, but when there is such a concentration in the wave peak, orbits can occur within or outside of 99.9% of peak samples, resulting in orbits that maintain their average velocity constant when away from the peak (within 99.9%) or orbits that decrease their velocities when away from the peak (out of 99.9%).

Therefore, dark matter and dark energy are neither matter nor energy, but probabilistic aspects of the distribution of samples in a population that resembles the normal distribution.

1.3.7 Antimatter

When an interval tends to concentrate its samples toward the median, which is the probable direction according to the central limit theorem, it is called matter. Antimatter is the opposite, when an interval tends to concentrate its samples in the direction opposite to the median.

The simplest way to visualize the probabilistic direction of samples of any wavelength is to look at the **probabilistic reference line**, as shown in Figure 34. The greater the amount of sample in an interval, the greater will be its probabilistic tendency towards the population median.

In the Figure 38 two identical intervals are shown with their samples at opposite concentrations.

Figure 38 – Identical interval with its opposite sample concentrations
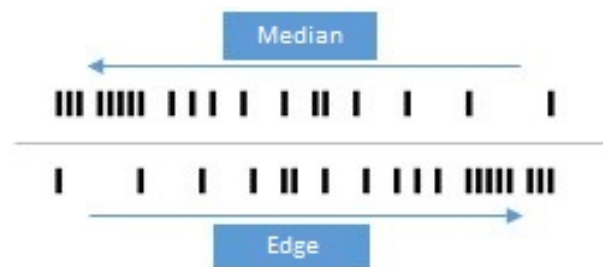
Identical interval distributed in opposite ways.

Merging or summing the opposite intervals in Figure 38 would make them a symmetric interval, that is, it would not be in any direction. The figure 39 shows one population with its samples concentrated toward the median and another with its samples concentrated toward the interval boundaries.

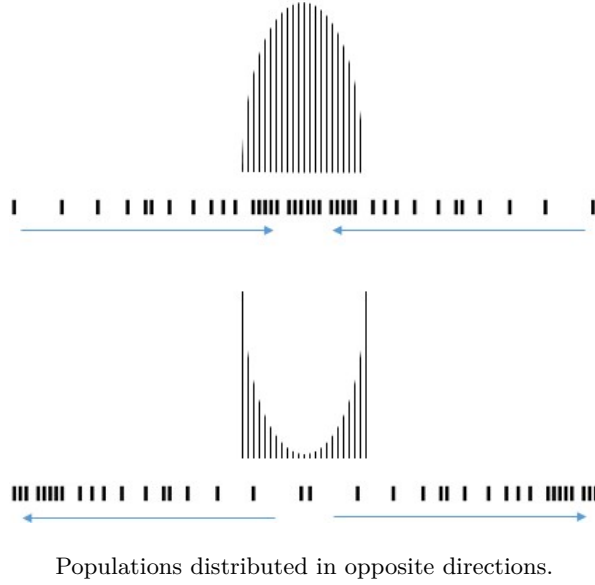Figure 39 – Populations with their opposite sample concentrations

Populations distributed in opposite directions.

1.3.8   Black Hole

The area of an interval grows as new samples are added into the population, as Figure 16, and with the addition of other already entangled intervals, as shown by the upper right subinterval in Figure 40. However, intervals that receive a large amount of samples within the population tend to form more and more subintervals at different levels, which contracts the occupied area of these intervals (because of the wave entanglement from the smaller subintervals sustaining these approximately quadratic areas) as shown by the purple and blue subintervals in Figure 40. So this relationship of the size of the interval with its amount of samples and their subintervals is the aspect that can help describe the so-called black holes, where the peak of the wave will occupy a smaller and smaller proportional subinterval within the interval of the wave, even with an increasing concentration of samples. These peaks are often found from the middle to the front of an interval or system (the core or peak of the system).

Figure 40 – Interval contraction
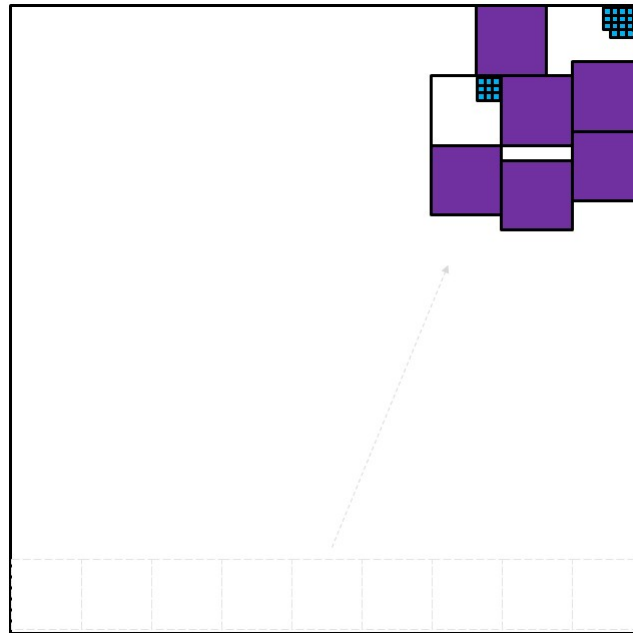
Relationship of interval size and its possible contraction as new subintervals appear.

1.3.9 Observer and life

The wave intervals (wavelengths) that a subconsciousness (sublogic) is able to observe depend on the wavelengths of which the subconscious itself is composed. Among all the possibilities of intervals or wavelengths allowed by a population, the observer is in one of them.

The ability to compare or distinguish the order of changes in a sequence of samples is the logical ability of an observer, the observer of time (past and present).The speed of this observation is given by the range that the observer is able to compare, that is, how quickly the observer is able to distinguish small changes (few samples - few logical moments) will make it realize that larger changes take longer (many samples - many logical moments).

The logical ability to make probabilistic prospections, within the logical limitations of the observer and based on the probability of distribution of the observed interval or subinterval, is the essence of thinking and, therefore, of life. These prospections are based on the probability of distribution of each interval (in the direction of the interval) and, therefore, are related to pattern detection and future probabilistic possibilities.

The ability to compare or distinguish logical waves (subsets or subconscious) is the ability that defines the subject [I - me]. The reasonableness of this definition depends on the proportionality of this ability to compare.

Typically, the most notable life forms are multiplied by being on the probabilistic average of the interval between their peaks and valleys, however different they may be. Something very discrepant or different from the average pattern of the interval tends not to multiply and remain.

Life IS NOT, like any other logic. And its meaning lies in what logic is in its

essence. Logic in its probabilistic essence is the order that emerges from the chaos of infinite possibilities, it is what physics calls gravity and the Bible calls Love when it says that God is Love. Therefore, the meaning of life is to be different, which in contrast to a straight line (representing nullity, indifference or non-existence) becomes discrepant with its peaks (waves), peaks that entangle and share their subintervals with the others of their waves, making their movements and their subintervals more harmonious and synchronized, which in some scales are called orbits in others love, when the human being orbits that which he loves, whatever it is. This is the meaning of life and of the whole universe, and not only this, besides giving meaning is what makes them possible. The human being can perhaps be considered the peak of the wave of the subsystems considered to be alive on earth, having the capacity to dominate and care for the others.

The free will is in the randomness of the new samples, despite the probabilistic sense of these samples toward the median of the population. And that is the only way to be exceptionally free from the cause and effect or action and reaction that predominate in all movement. So it can be argued that anything a person has done is the fault of the universe, or moreover, the fault of logic that IS NOT, rigorously what the universe and men are. The relevant fact is that all possibilities are valid and perhaps this is the greatest justice of all. Considering something or someone guilty or anything else is part of these possibilities, so the essence of the world is in the difference and every different movement tends to have different reactions.

1.3.9.1 Senses

The cognitive part of a wave is not observed directly, but rather the outside - the consciousness, the whole or more commonly a part of that whole. This observation may include the rest of the wave that the cognitive part is part of, which is also external to the cognitive part, and so the cognitive part may be a nested subinterval of another. The cognitive part of the human subconscious is probably where the largest wave peak of the human subset is found. This is where the greatest intensity of change is observed. This great intensity of change is largely characterized by human thinking (observation and probabilistic prospecting of an interval) that tends toward infinity, as well as the essence of logic, the [NOT BEING].In other words, the cognitive part is the part that is closest to logic in its essence and also to its totality (consciousness).

The taking of samples by human beings, through the senses, modifies them and these ripples act as adjustments or configurations. Each sense observes the sample population independently, as distinct frequency channels. Thus, eyesight can be seeing objects very far away and ears hearing sounds that are very close. The senses are limited by the waves that constitute the observer and their maximum observation capacity is limited in the maximum depth of the nested intervals observed.

An important feature of the process of observing small intervals is that they can be observed with particles or waves. In particle observation, the observer follows an interval represented by an entangled pair, observing its consistent shape and movement in space. In the particle effect, the consistency of the shape and its movements are established by the entangled pair, since the jump occurs on one side of the pair at a time, guaranteeing stability in the changes. In the interval observed as a wave, the observer follows one of the parts that make up the entangled pair, observing its movements and jumps, since the jumps are frequent in small intervals.

It may not be possible to observe the wave effect without entangling its pair. The high frequency of this interval causes it to rapidly transit in an area around it, which may make it easier for it to reach a specific point in space, such as the human eye, that collapses its particle effect. This collapse can occur in a wider location (such as a wall or screen), and observe its wave effect with the collapse of many samples.

1.4   Observations

Core The negation of logic to itself (nothingness) gave rise to three axioms that are the basis of the core theorem of this theory and the basis for existence. This theorem gives rise to waves and their main attribute, wave entanglement.

Logical rigidity If physical rigidity and its laws seem insurmountable, below it is logic, even more rigid and insurmountable, because outside logic is the non-existent, the illogical. Existence is contained in the possibilities of what is logical.

Mathematics Logic in its essence is not subject to mathematics, but all mathematics is restricted to logic, and therefore some of its simplest constructions may come closer to essential logic than others.

Biology Perhaps this study can deepen or help to clarify the so-called horizontal gene transfer, since the probability of sampling distribution in subintervals with spatial or temporal approximations can make them share similarities in their developmental patterns.

Good and evil Good and evil depend on the observer and are only valid possibilities among infinite others. Perhaps the greatest justice of the universe or logic is the non-exclusion of any path or possibilities. That is, if it is light, negation tends to darken, if it is hot to cool, etc. It is the struggle of opposites of Heraclitus of Ephesus.

Perfection The primordial logic is the simplest logic, it is the essence of existence. A logic as simple as it is efficient, as efficient as it is perfect:

> **Omnipotent** The essence of all logical possibilities, that is, the essence of existence, because outside of logical possibilities is the illogical, the non-existent;
>
> **Omniscient** Flow of all logical abstractions from consciousness to the subconsciousnesses;
>
> **Omnipresent** Its fractions (negations) are in all existence.

These remarks refer to God, the consciousness of subconsciousnesses. Ultimately, God is Logic, from its infinitesimal and fundamental negation of itself to its infinite greatness. God is love, therefore, the order or attraction that is present in all scales of existence.

Equality Equality is infinitely improbable in the universe. Difference is the key to life. As an example, racism (predominance of one social or ethnic group) is a form of equality because it does not accept the other groups. Trying to level society in all its aspects is also a form of equality because it does not accept the variations it can have. Even in the Bible there was a fight for equality, since Jesus, being God (trinity), accepted and said that the father is greater than Him, however, the fallen angel wanted to be equal to God and was expelled by Michael, whose name means "Who is like God?" or "there is none like God". With these observations it is clear that to compromise

with the disrespect for differences is to compromise against life, because to respect life is to love and protect its diversity. The more diversity the richer life is, therefore, to live or let live in situations that oppose love, when there are conditions contrary to this, is a disrespect to life because it threatens its diversity.

Reality As a logical possibility, the dream is as real as "reality". Perhaps the study of logical possibilities leads to paths where dreams can be as real as reality, since both are just logic, like lucid dreams, for example (ASPY et al., 2017). This may explain why other possible forms of "intelligent" life, when evolved, stop looking for this kind of life in a possible vast universe and look within themselves, where something much larger than the universe can be found, infinite.

Convergence Quantum jump and entanglement are some of the behaviors that already challenge the physical world, and may be the point of convergence with this new paradigm.

Final Considerations

This is a study of primordial logic that resulted in a theory about the origin of everything. All lines of reasoning in this study can be deepened and detailed.

Eventually it can be considered a philosophical and/or scientific study, however the basis of these two important branches is logic, the core of this theory.

The answer to the central question of this study (if there is something rather than nothing) comes from logic. The study of logic has given rise to a theory about the origin of all things. This theory answers what consciousness, waves, infinity, time, space, fundamental forces, dark matter, dark energy, antimatter, the black hole and the observer/life are.

May the model of this study be the beginning of a new era. An era where the human being can develop himself and see that he is the host of infinity. May this evolution turn dreams into reality and may it be possible to observe that reality is no different from a dream, since both are just logical.

The idea that something physical came out of nothing is inconsistent with the nature of nothing.

Bibliography

ASPY, D. et al. Reality testing and the mnemonic induction of lucid dreams: Findings from the national australian lucid dream induction study. *Dreaming*, v. 27, p. 206–231, 09 2017. Available from Internet: <https://www.researchgate.net/publication/319855294_ Reality_testing_and_the_mnemonic_induction_of_lucid_dreams_Findings_from_ the_national_Australian_lucid_dream_induction_study>. Accessed on: 18 nov 2021. Cited on the page 41.

CONSTANT. In: Collins, English definition dictionary. 2021. Collins English Dictionary. Available from Internet: <https://www.collinsdictionary.com/dictionary/english/ constant>. Accessed on: 15 nov 2021. Cited on the page 4.

FROST, J. *Central Limit Theorem Explained.* 2018. Website Statistics By Jim. Available from Internet: <https://statisticsbyjim.com/basics/central-limit-theorem>. Accessed on: 05 nov 2019. Cited on the page 8.

GLEN, S. *Central Limit Theorem: Definition and Examples in Easy Steps.* 2019. Website Statistics How To. Available from Internet: <https://www.statisticshowto.datasciencecentral.com/probability-and-statistics/normal-distributions/central-limit-theorem-definition-examples>. Accessed on: 01 nov 2019. Cited on the page 7.

GRAHAM, D. W. Heraclitus. In: ZALTA, E. N. (Ed.). *The Stanford Encyclopedia of Philosophy.* Summer 2021. Metaphysics Research Lab, Stanford University, 2021. Available from Internet: <https://plato.stanford.edu/archives/sum2021/entries/heraclitus/>. Accessed on: 16 nov 2021. Cited on the page 7.

LEIBNIZ, G. W. The ultimate origin of things. 1697. Available from Internet: <http://www.leibniz-translations.com/ultimateorigination.htm>. Accessed on: 18 nov 2021. Cited on the page 2.

LOGIC. In: Collins, English definition dictionary. 2021. Collins English Dictionary. Available from Internet: <https://www.collinsdictionary.com/dictionary/english/logic>. Accessed on: 15 nov 2021. Cited on the page 3.

ORDERED field. In: WIKIPEDIA: the free encyclopedia. Wikimedia, 2021. Available from Internet: <https://en.wikipedia.org/wiki/Ordered_field>. Accessed on: 18 nov 2021. Cited on the page 7.

PALMER, J. Parmenides. In: ZALTA, E. N. (Ed.). *The Stanford Encyclopedia of Philosophy.* Winter 2020. Metaphysics Research Lab, Stanford University, 2020. Available from Internet: <https://plato.stanford.edu/archives/win2020/entries/parmenides/>. Accessed on: 16 nov 2021. Cited on the page 3.

PARETO principle. In: WIKIPEDIA: the free encyclopedia. Wikimedia, 2021. Available from Internet: <https://en.wikipedia.org/wiki/Pareto_principle>. Accessed on: 18 nov 2021. Cited on the page 10.

PARKER, D. *BigDecimal - C# implementation of an arbitrary size, arbitrary precision decimal number class, with relevant mathematical operations.* 2018. GitHub - proprietary software. Available from Internet: <https://github.com/dparker1/BigDecimal/blob/3e0a4f1ba4c72c0b28d6571fcc6259558be104bd/BigDecimal/BigDecimal.cs>. Accessed on: 27 nov 2019. Cited on the page 45.

PERKOWITZ, S. *twin paradox.* 2013. Encyclopedia Britannica. Available from Internet: <https://www.britannica.com/science/twin-paradox>. Accessed on: 18 nov 2021. Cited on the page 20.

PIERCE, R. *The Binomial Distribution.* 2018. Website Math is Fun. Available from Internet: <http://www.mathsisfun.com/data/binomial-distribution.html>. Accessed on: 05 nov 2019. Cited 2 times on pages 8 and 43.

PIERCE, R. *Pascal's Triangle.* 2018. Website Math is Fun. Available from Internet: <http://www.mathsisfun.com/pascals-triangle.html>. Accessed on: 05 nov 2019. Cited on the page 6.

PRESBURGER arithmetic. In: WIKIPEDIA: the free encyclopedia. Wikimedia, 2021. Available from Internet: <https://en.wikipedia.org/wiki/Presburger_arithmetic>. Accessed on: 18 nov 2021. Cited on the page 7.

REAL closed field. In: WIKIPEDIA: the free encyclopedia. Wikimedia, 2021. Available from Internet: <https://en.wikipedia.org/wiki/Real_closed_field>. Accessed on: 07 mar 2021. Cited on the page 7.

APPENDIX A – Algorithms

BinomialDistribution_PROB and Distribution_PROB

The BinomialDistribution_PROB algorithm generates the probability of distribution of an interval and uses the general binomial probability formula below. This algorithm has the same result as the Distribution_PROB algorithm, but the BinomialDistribution_PROB execution is much faster and has higher capacity because it uses large numbers like BigInteger and BigDecimal. Both algorithms were done in C# with LINQPad 5 [7]. The Figure 41 shows the results of the algorithms for the range 0 to 10, analogous to flipping 10 coins on the ground, adding up the values of the heads and tails, with the tails having the value one and the heads having the value two. The Distribution_PROB algorithm sums each of the 1024 possibilities [1,1,1,1,1,1,1,1,1,1,1,1 - 1,1,1,1,1,1,1,1,1,1,1,1, 2 - ....] and groups these values together. In the Distribution_PROB algorithm, this set of possibilities is a Cartesian product of the possible combinations, which makes this algorithm slow, but it is important to validate and facilitate understanding of the general binomial probability formula used in the BinomialDistribution_PROB algorithm (PIERCE, 2018a). In the Figure 41, the table within Distribution_PROB shows this grouping and the total number of possibilities, 1024. Dividing each grouped value by the total gives the probabilistic result achieved by the formula used in BinomialDistribution_PROB. For example, the probability that the sum of the 10 coins flipped is 12 is equal to 45/1024, or 0.0439453125 or 4.39%.

$$f(k; n, p) = \binom{n}{k} p^k (1-p)^{n-k}$$

---

[7] LINQPad 5 is on <www.linqpad.net> and can be used in its free version (Standard edition) without expiration.

Figure 41 – Results of the BinomialDistribution_PROB and Distribution_PROB algorithms
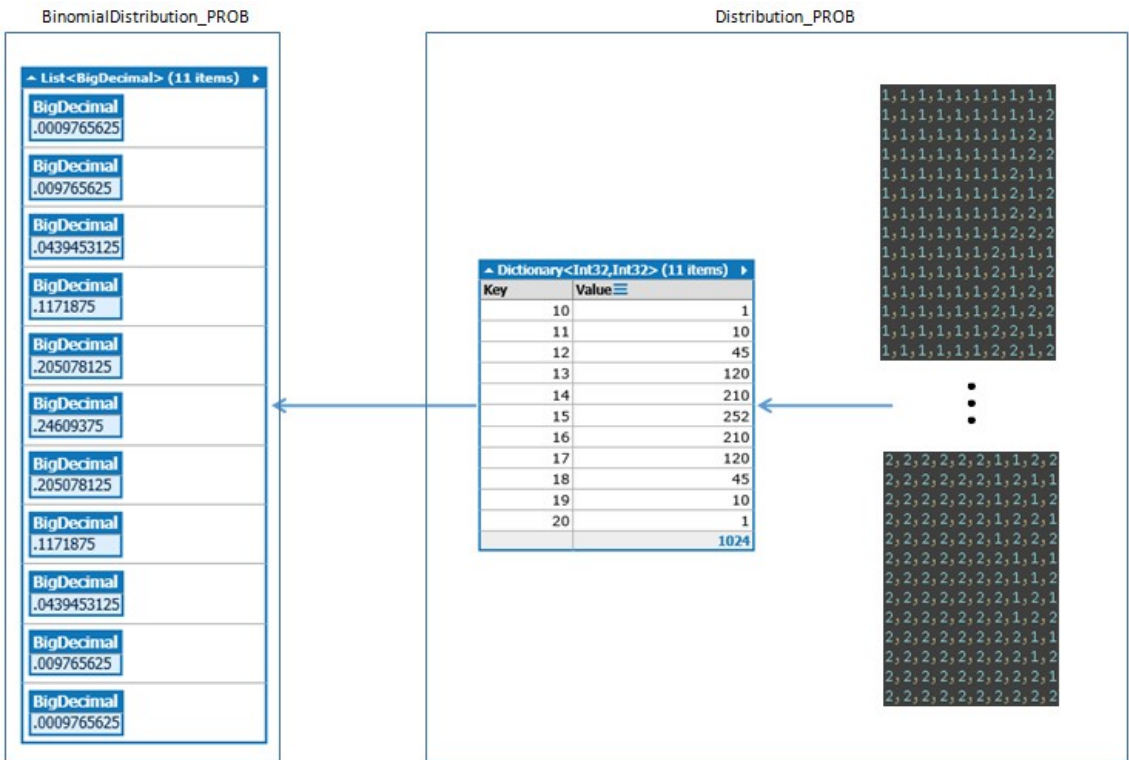
The Distribution_PROB algorithm intends to clarify the probabilistic essence of the central limit theorem.

The Distribution_PROB algorithm can also be used for the roll of 5 6-sided dice or 6 5-sided dice, for example. As can be seen in the Figure below, the probability distribution on the dice roll is similar to the binomial distribution (coins).

Figure 42 – Results of the Distribution_PROB algorithm

▲ Dictionary<Int32,Int32> (26 items) ▶	
Key	Value ≡
5	1
6	5
7	15
8	35
9	70
10	126
11	205
12	305
13	420
14	540
15	651
16	735
17	780
18	780
19	735
20	651
21	540
22	420
23	305
24	205
25	126
26	70
27	35
28	15
29	5
30	1
	7776

▲ Dictionary<Int32,Int32> (25 items) ▶	
Key	Value ≡
6	1
7	6
8	21
9	56
10	126
11	246
12	426
13	666
14	951
15	1246
16	1506
17	1686
18	1751
19	1686
20	1506
21	1246
22	951
23	666
24	426
25	246
26	126
27	56
28	21
29	6
30	1
	15625

(a) 5 6-sided dice   (b) 6 5-sided dice

The probability distribution on the dice roll is consonant to the binomial distribution.

BinomialDistribution_PROB [Code]

To execute the code snippet requires the implementation of BigDecimal, an example of that implementation can be seen, obeying proprietary software license rights, at (PARKER, 2018). This study does not distribute nor is it responsible for the portion of the code related to the BigDecimal implementation, these responsibilities being the responsibility of the executor of this software.

```
//https://www.mathsisfun.com/data/quincunx-explained.html
void Main()
{
    BinomailDistribuition.Possibilities = 10;
    var results = new List<BigDecimal>();
    results.Load();
    results.Print(true); //send false to print Table 1.
}

public static class BinomailDistribuition
{
    public static int Possibilities = 0;
    static int middleLeft = 0;
    static int middleRight = 0;
    static int resultCount = 0;

    public static void Load(this List<BigDecimal> results)
    {
        for (int i = 0; i <= Possibilities; i++)
        {
            var fatorLeft = Fatorial(Possibilities);
            var fatorRight = BigInteger.Multiply(Fatorial(i), Fatorial(Possibilities - i));
            BigInteger fat = BigInteger.Divide(fatorLeft, fatorRight);
            var powLeft = new BigDecimal(1, 0, 1000000000);
            var powRight = new BigDecimal(1, 0, 1000000000);
            if (i != 0)
                powLeft = BigDecimal.Pow(new BigDecimal(5, 1, 1000000000), i);
```

45

```csharp
                if (i != Possibilities)
                    powRight = BigDecimal.Pow(new BigDecimal(5, 1, 1000000000), (Possibilities - i));
                var prob = new BigDecimal(fat) * powLeft * powRight;
                results.Add(prob);
            }
        }

    public static BigInteger Fatorial(int value)
    {
        BigInteger fatorial = 1;
        for (int n = 1; n <= value; n++)
        {
            fatorial *= n;
        }
        return fatorial;
    }

    public static void Print(this List<BigDecimal> results, bool printTableProbability)
    {
        if (!printTableProbability)
        {
            var sum = results.Sum();
            var middle = (middleRight - middleLeft) / 2;
            var middlePercent = ((middleRight - middleLeft) * 14) / 100;
            var list = results.Where((x, i) => i >= middleLeft && i <= middleRight).ToList();
            var listPareto = list.Where((x, i) => i >= (middle - middlePercent)
                                              && i <= (middle + middlePercent)).ToList();
            var percentOfSum = (middleRight - middleLeft) * 100 / resultCount;
            var sumPercent = sum * new BigDecimal(100, 0, 1000000000);
            var paretoResult = new BigDecimal(0, 0, 1000000000);
            listPareto.ForEach(x => { paretoResult = paretoResult + x; });

            sumPercent.Dump("sum");
            middleLeft.Dump("middleLeft");
            middleRight.Dump("middleRight");
            (middleRight - middleLeft).Dump("itens of sum");
            percentOfSum.Dump("percent of sum");
            resultCount.Dump("total");
            paretoResult.Dump("20/80");
        }
        else
        {
            results.Dump(); //Valid Binomial distribution
        }
    }

    public static BigDecimal Sum(this List<BigDecimal> results)
    {
        resultCount = results.Count;
        middleLeft = resultCount / 2;
        middleRight = middleLeft * 2 < resultCount ? middleLeft + 1 : middleLeft;

        var sum = middleLeft != middleRight ? results[middleLeft] + results[middleRight] : results[middleRight];
        while ((sum * new BigDecimal(100, 0, 1000000000)) < new BigDecimal(9999, 2, 1000000000))
        {
            middleLeft--;
            middleRight++;
            if (middleLeft >= 0)
                sum = sum + results[middleLeft];
            if (middleRight <= Possibilities)
                sum = sum + results[middleRight];
        }
        return sum;
    }
}

//Exemple of BigDecimal class - https://github.com/dparker1/BigDecimal/blob/
//3e0a4f1ba4c72c0b28d6571fcc6259558be104bd/BigDecimal/BigDecimal.cs
```

Distribution_PROB [Code]

```csharp
//https://exercicios.brasilescola.uol.com.br/exercicios-matematica/
//exercicios-sobre-probabilidade-condicional.htm#questao-1
void Main()
{
    var dice = 2; //Binomial distribution, dice = 2;
    var events = 10;
    var sampling = Math.Pow(dice, events);
```

```
    var cartesianProduct = dice.ToArrays(events).CartesianProduct();
    cartesianProduct.PrintGroup(events, dice);
}

public static class CartesianProductContainer
{
    public static IEnumerable<IEnumerable<int>> CartesianProduct(this IEnumerable<IEnumerable<int>> sequences)
    {
        IEnumerable<IEnumerable<int>> emptyProduct = new[] { Enumerable.Empty<int>() };
        var result = sequences.Aggregate(
            emptyProduct,
            (accumulator, sequence) =>
                from accseq in accumulator
                from item in sequence
                select new[] { accseq.Concat(new[] { item }).Sum() });

        return result;
    }

    public static IEnumerable<List<int>> ToArrays(this int dice, int events)
    {
        var result = new List<List<int>>();
        for (int j = 1; j <= events; j++)
        {
            var array = new List<int>();
            for (int i = 1; i <= dice; i++)
                array.Add(i);

            result.Add(array);
        }

        return result;
    }

    public static void PrintGroup(this IEnumerable<IEnumerable<int>> list, int events, int dice)
    {
        var listCountDict = Enumerable.Range(1, dice * events).ToDictionary(x => x);
        Group(listCountDict, list);
        listCountDict.Dump("Values");
    }

    public static void Group(Dictionary<int, int> dict, IEnumerable<IEnumerable<int>> list)
    {
        foreach (var key in dict.Keys.ToList())
            dict[key] = 0;

        foreach (var item in list)
            dict[item.First()]++;

        var zeroKey = 0;
        foreach (var item in dict)
            if (item.Value == 0)
                zeroKey = item.Key;
            else continue;

        for (int i = 1; i <= zeroKey; i++)
            dict.Remove(i);
    }
}
```

Logic_WavePattern

The Logic_WavePattern algorithm results in the display of a histogram that assumes the wave pattern when placed side by side each of the bars on the left and right side of the median. This histogram is generated from randomizing the values according to Figure 10 and Figure 11, following the central limit theorem.
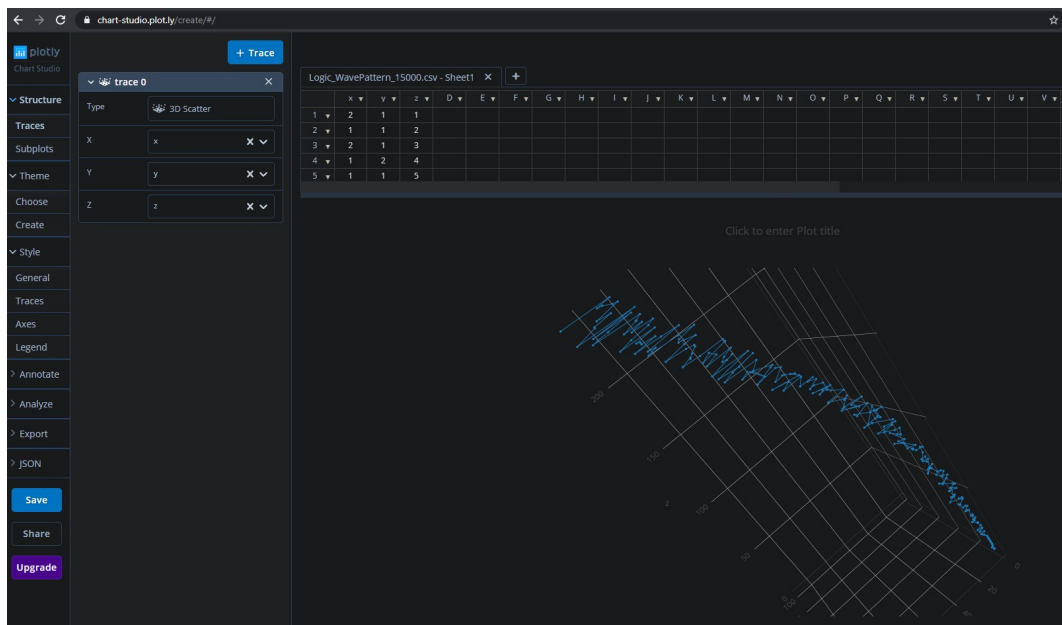
Figure 43 – Histogram in the wave pattern of the Logic_WavePattern algorithm

Randomly generated result displayed by the Logic_WavePattern algorithm.

Another result of the Logic_WavePattern algorithm is obtained from the LINQPad 5 console, which outputs a file in ".csv" format that can be imported into Plotly's Chart Studio <https://chart-studio.plot.ly/create> for generating a 3D scatter plot. The most important part of the graph are the points that represent the most easily visible part and that are most likely at the top of each histogram bar in the previous Figure. Lines are used to facilitate the visualization of spirals that are already starting to form even with very low volumes of data and without the entanglement of intervals (ordering).

Figure 44 – 3D scatter plot of the Logic_WavePattern algorithm

The example can be accessed at: <https://chart-studio.plot.ly/create/?fid=ren.stuchi:5&fid=ren.stuchi:4>.

Logic_WavePattern [Code]

```
//http://csharphelper.com/blog/2015/09/draw-a-simple-histogram-in-c/
//https://github.com/naudio/NAudio.WaveFormRenderer
```

```csharp
[STAThread]
void Main()
{
  Application.EnableVisualStyles();
  Application.Run(new MainForm());
}

public partial class MainForm : Form
{
  public MainForm()
  {
    InitializeComponent();
  }
  //############################################################################
  private const int LENGHT = 30000;
  private const int GROUP = 2;
  //############################################################################
  private double m_dZoomscale = 1.0;
  public static double s_dScrollValue = .25;
  private Point MouseDownLocation;
  private Matrix transform = null;
  private NumbsOfCentralLimitTheorem.HistogramResult histogramResult = null;
  private bool printed = false;

  private void MainForm_Load(object sender, EventArgs e)
  {
    histogramResult = GetHistogramOfCentralLimitTheorem(LENGHT, GROUP);

    RectangleF data_bounds = new RectangleF(0, 0, histogramResult.Size, histogramResult.MaxValue * 2);
    PointF[] points =
    {
        new PointF(0, pictHistogram.ClientSize.Height),
        new PointF(pictHistogram.ClientSize.Width, pictHistogram.ClientSize.Height),
        new PointF(0, 0)
      };
    transform = new Matrix(data_bounds, points);
  }

  private void pictHistogram_Paint(object sender, PaintEventArgs e)
  {
    DrawHistogram(e.Graphics, pictHistogram.BackColor, histogramResult,
      pictHistogram.ClientSize.Width, pictHistogram.ClientSize.Height);
  }

  private void pictHistogram_Resize(object sender, EventArgs e)
  {
    pictHistogram.Refresh();
  }

  private void DrawHistogram(Graphics gr, Color back_color,
    NumbsOfCentralLimitTheorem.HistogramResult histogramResult, int width, int height)
  {
    PrintResult();
    gr.Clear(back_color);
    gr.Transform = transform;
    gr.ScaleTransform((float)m_dZoomscale, (float)m_dZoomscale);
    FillRectangle(gr, Color.Black, histogramResult.Up, histogramResult.MaxValue, false);
    FillRectangle(gr, Color.Gray, histogramResult.Down, histogramResult.MaxValue, true);
  }

  private void PrintResult()
  {
    if (!printed)
    {
      printed = true;
      var listTuple = new List<(float x, float y, float z)>();
      float previousValueOfZ = 0;
      for (int i = 0; i < histogramResult.Up.Count(); i++)
      {
        if (histogramResult.Up[i] != 0.0001f && histogramResult.Down[i] != 0.0001f)
        {
          if (histogramResult.Up[i] % 1 == 0)
            previousValueOfZ = (int)(previousValueOfZ + 1f);
          else
            previousValueOfZ += 0.1f;
          var tuple = (x: histogramResult.Up[i], y: histogramResult.Down[i], z: previousValueOfZ);
          listTuple.Add(tuple);
        }
      }
      Console.WriteLine("x,y,z");
      foreach (var tuple in listTuple)
        Console.WriteLine(tuple.x.ToString() + "," + tuple.y.ToString() + "," + tuple.z.ToString());
    }
```

```csharp
    }

    protected void FillRectangle(Graphics gr, Color color, float[] arrayValues, float maxValue, bool down)
    {
      using (Pen thin_pen = new Pen(color, 0))
      {
        for (int i = 0; i < histogramResult.Down.Length; i++)
        {
          RectangleF rect;
          if (!down)
            rect = new RectangleF(i, maxValue, 1, arrayValues[i]);
          else
            rect = new RectangleF(i, maxValue - arrayValues[i], 1, arrayValues[i]);
          using (Brush the_brush = new SolidBrush(color))
          {
            gr.FillRectangle(the_brush, rect);
            gr.DrawRectangle(thin_pen, rect.X, rect.Y, rect.Width, rect.Height);
          }
        }
      }
    }

    protected void pictHistogram_OnMouseWheel(object sender, MouseEventArgs mea)
    {
      pictHistogram.Focus();
      if (pictHistogram.Focused == true && mea.Delta != 0)
        ZoomScroll(mea.Location, mea.Delta > 0);
    }

    private void ZoomScroll(Point location, bool zoomIn)
    {
      transform.Translate(-location.X, -location.Y);
      if (zoomIn)
        m_dZoomscale = m_dZoomscale + s_dScrollValue;
      else
        m_dZoomscale = m_dZoomscale - s_dScrollValue;
      transform.Translate(location.X, location.Y);
      pictHistogram.Invalidate();
    }

    private void pictHistogram_MouseDown(object sender, MouseEventArgs e)
    {
      if (e.Button == System.Windows.Forms.MouseButtons.Left)
        MouseDownLocation = e.Location;
    }

    private void pictHistogram_MouseMove(object sender, MouseEventArgs e)
    {
      if (e.Button == System.Windows.Forms.MouseButtons.Left)
      {
        transform.Translate((e.Location.X - MouseDownLocation.X)
          / 40, (e.Location.Y - MouseDownLocation.Y) / 40, MatrixOrder.Append);
        this.Refresh();
      }
    }

    private NumbsOfCentralLimitTheorem.HistogramResult GetHistogramOfCentralLimitTheorem(int length, int group)
    {
      var numbsOfCentralLimitTheorem = new NumbsOfCentralLimitTheorem();
      numbsOfCentralLimitTheorem.RandomResult(length);
      return numbsOfCentralLimitTheorem.GenerateHistogram(group);
    }
}

partial class MainForm
{
  private System.ComponentModel.IContainer components = null;

  protected override void Dispose(bool disposing)
  {
    if (disposing && (components != null))
      components.Dispose();
    base.Dispose(disposing);
  }

  private void InitializeComponent()
  {
    this.pictHistogram = new System.Windows.Forms.PictureBox();
    ((System.ComponentModel.ISupportInitialize)(this.pictHistogram)).BeginInit();
    this.SuspendLayout();
    this.pictHistogram.Anchor = ((System.Windows.Forms.AnchorStyles)(((((System.Windows.Forms.AnchorStyles.Top
          | System.Windows.Forms.AnchorStyles.Bottom)
          | System.Windows.Forms.AnchorStyles.Left)
```

```
                | System.Windows.Forms.AnchorStyles.Right)));
    this.pictHistogram.BackColor = System.Drawing.Color.White;
    this.pictHistogram.Cursor = System.Windows.Forms.Cursors.Cross;
    this.pictHistogram.Location = new System.Drawing.Point(8, 6);
    this.pictHistogram.Name = "pictHistogram";
    this.pictHistogram.Size = new System.Drawing.Size(550, 250);
    this.pictHistogram.TabIndex = 1;
    this.pictHistogram.TabStop = false;
    this.pictHistogram.Resize += new System.EventHandler(this.pictHistogram_Resize);
    this.pictHistogram.Paint += new System.Windows.Forms.PaintEventHandler(this.pictHistogram_Paint);
    this.pictHistogram.MouseWheel += new System.Windows.Forms.MouseEventHandler(this.pictHistogram_OnMouseWheel);
    this.pictHistogram.MouseDown += new System.Windows.Forms.MouseEventHandler(this.pictHistogram_MouseDown);
    this.pictHistogram.MouseMove += new System.Windows.Forms.MouseEventHandler(this.pictHistogram_MouseMove);
    this.AutoScaleDimensions = new System.Drawing.SizeF(6F, 13F);
    this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font;
    this.ClientSize = new System.Drawing.Size(563, 262);
    this.Controls.Add(this.pictHistogram);
    this.Name = "MainForm";
    this.Text = "Logic_WavePattern";
    this.Load += new System.EventHandler(this.MainForm_Load);
    ((System.ComponentModel.ISupportInitialize)(this.pictHistogram)).EndInit();
    this.ResumeLayout(false);
  }

  internal System.Windows.Forms.PictureBox pictHistogram;
}

public class NumbsOfCentralLimitTheorem
{
  public float[] ResultList { get; set; }
  public int ResultLength { get; set; }
  public float[] LastList { get; set; }
  public float[] CurrentList { get; set; }
  public int SizeLastList { get; set; }
  public Dictionary<int, float> Histogram { get; set; }

  public NumbsOfCentralLimitTheorem()
  {
    SizeLastList = 2;
    StartLastList();
    StartCurrentList();
  }

  public float[] RandomResult(int length)
  {
    ResultLength = length;
    ResultList = new float[length];
    Random rnd = new Random();
    for (int x = 0; x < length; x++)
    {
      float lineSum = 0;
      for (int i = 1; i < SizeLastList; i++)
      {
        var lastValueLeft = LastList[i - 1];
        var lastValueRight = LastList[i];
        var rndValue = (float)rnd.NextDouble(lastValueLeft, lastValueRight);
        lineSum = lineSum + (rndValue - lastValueLeft);
        CurrentList[i] = rndValue;
      }
      if (lineSum != 0)
        ResultList[x] = lineSum;
      SizeLastList++;
      LastList = CurrentList;
      StartCurrentList();
    }
    return ResultList;
  }

  public HistogramResult GenerateHistogram(int group)
  {
    Histogram = new Dictionary<int, float>();
    var minValue = ResultList.Min();
    var maxValue = ResultList.Max();
    var rangeValue = maxValue - minValue;
    var amountOfGroups = ResultLength / group;
    var intervalValue = rangeValue / amountOfGroups;
    foreach (var value in ResultList)
    {
      int key = (int)(value / intervalValue);
      if (!Histogram.ContainsKey(key))
        Histogram[key] = 0;
      Histogram[key]++;
    }
```

```csharp
            var histogramResult = HistogramResult.Get(Histogram);
            return histogramResult;
        }

        private void StartCurrentList()
        {
            var sizeCurrentList = SizeLastList + 1;
            CurrentList = new float[sizeCurrentList];
            CurrentList[0] = 0;
            CurrentList[sizeCurrentList - 1] = float.MaxValue / 2;
        }

        private void StartLastList()
        {
            LastList = new float[SizeLastList];
            LastList[0] = 0;
            LastList[SizeLastList - 1] = float.MaxValue / 2;
        }

        public class HistogramResult
        {
            public int Size { get; set; }
            public float MaxValue { get; set; }
            public float[] Up { get; set; }
            public float[] Down { get; set; }

            public static HistogramResult Get(Dictionary<int, float> histogram)
            {
                var histogramOrdered = histogram.OrderBy(k => k.Key);
                var result = new HistogramResult();
                var lengthOdd = histogram.Count % 2 > 0;
                var middle = histogram.Count / 2;
                var middleValue = histogramOrdered.ElementAt(middle).Key;
                result.Size = middleValue;
                result.MaxValue = histogram.OrderBy(k => k.Value).Last().Value;
                result.Up = ArrangeArray(new float[middleValue]);
                result.Down = ArrangeArray(new float[middleValue]);
                for (int i = 0; i < middle; i++)
                {
                    var keyValue = histogramOrdered.ElementAt(i);
                    result.Up[keyValue.Key] = keyValue.Value;
                }
                for (int i = lengthOdd ? middle + 2 : middle + 1; i < histogram.Count; i++)
                {
                    var totalValue = middleValue * 2;
                    var keyValue = histogramOrdered.ElementAt(i);
                    result.Down[totalValue - keyValue.Key] = keyValue.Value;
                }
                return result;
            }

            private static float[] ArrangeArray(float[] array)
            {
                for (int i = 0; i < array.Length; i++)
                    array[i] = 0.0001F;
                return array;
            }
        }
    }

    public static class rndExtension
    {
        public static double NextDouble(this Random rng, double minimum, double maximum)
        {
            return rng.NextDouble() * (maximum - minimum) + minimum;
        }
    }
```