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THE COLD
BIG BANG MODEL
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I dedicate this work to the
memory of my father,
Mihail IONESCU

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Science is how the human race explains its creation.

THE COLD BIG BANG MODEL
OR
HOW SPACE, TIME AND MASS ENERGY WERE CREATED

Summary

- The paper presents the hypothesis of building and evolving, step by step, from scratch the elements *space-energy-mass-time*[1] which together define the universe;
- Some fundamental concepts are redefined, such as:
    - *Space* It is not defined here as a form into which matter is poured, such as a geometry arising from a differentiable manifold, or as a philosophical category designating objective forms of existence. In this work space, *energy-mass* and *time* are a unitary whole that is the universe itself. So that the gap between these concepts and the classical ones is not insurmountable, I will divide universe in two concepts with which to operate: *time* and *space-energy-mass*. These concepts are given a new identity by incorporating several axioms;
    - *Time* is defined as a result of the process *"Creatio ex nihilo*" attached to logical-mathematical thinking, which has the immediate effect of avoiding logical-mathematical paradoxes, on the one hand, and on the other, raises the problem of becoming mathematical objects in time. The entire paper is based on the generalization of these notions of *space-energy-mass-time*, at the scale of the entire universe, starting from the

[1] Common nouns that refer to concepts redefined in this paper I will write in italics.

process of *"Creatio ex nihilo*" made by Creative Consciousness;

- *space-energy-mass* is the part that remains of the concept of universe after extracting (against nature) *time*. The paper identifies *space-energy-mass* with *dark matter,* notion present in contemporary cosmology;
- *Time* and *space-energy-mass* are explained (presented) by logical-mathematical models of the discontinuous. The mathematical formalism of the linear continuum will be used less frequently, and the results will be quantified;
- *Quantum gravity*, defined here, it is the element that gives dynamics to the universe;
- *Dark energy* is defined coherently.

- the cosmological inflation hypothesis is preserved;
- Based on the axioms, definitions and theorems in the paper, we built a software application that generates models of universes that can be analyzed through the generated reports and images. The paper presents, for different definitions of universes, several reports and images. Due to the huge computational times, evolutions of universes unfolding over only a few tens of millions of Planck time units are presented. The digital model does not claim to calculate, step by step, the universe over long periods of *time,* which is why it does not address issues related to how it works *dark energy*; However, in order not to occur gross violations of the laws of conservation of energy and information, algorithms store quantitatively *dark energy* perhaps for future developments;
- By its consequences, this work:
  - answer or invalidate, or render useless questions like*: If the universe is finite, then what is beyond it? or How is it possible that all this huge amount of matter in the universe arose out of nothing or was concentrated in an infinitely small and dense point?*
  - answer the question *Why is time not reversible?*

- to answer the above questions, this paper does not force us to add new hypotheses such as *the cyclicity of Big Bangs and implosions* or *interaction with parallel universes* (how can they be parallel if they interact?!) and this only to save the hot Big Bang hypothesis;
- The paper excludes one of the hypotheses of the end of the universe, namely the *Great Frost hypothesis*;
- Cancel *The informational paradox of the black hole* of Stephen Hawking, because according to this paper (The Cold Big Bang Model) and related articles there is another process related to black holes what prevents Hawking radiation from eventually evaporating them;
- The missing process mentioned above explains why supermassive black holes exist in the universe, even in the early universe, as long as it seems that the age of the universe is too young to allow the formation of such giants only by matter absorption and/or mergers and/or direct implosion of matter in the early universe;
- The paper shows that the value gravitational constant subtract in time And besides, it depends on age; and mass total of the universe. At the 1979 Lindau Nobel Laureate Meeting, Paul Dirac made a similar hypothesis;
- demonstrates that in a universe where space and time are discrete, the maximum possible velocity is finite;
- proposes a specific set of Lorentz transformations that does not contradict a discrete universe;
- demonstrates the existence of fundamental constants of any universe, such as the amount of *dark matter* released by *inflation* and the radiation constant;
- calculates the huge amount of energy that could be extracted from so-called "empty space";

Introduction

This paper is a plea in support of the idea that the universe we live in is a simulation, that is, there is a Person, a Consciousness that thinks a mechanism for building components that evolve and engage in a unitary whole that I will call the Universe[2].

Obviously, a logical-mathematical demonstration of the above statement cannot be made, but I will try to give it value by building, literally, a digital model that contains both the construction mechanisms and the resultant components of a unitary whole that could be the primordial universe at the level of human understanding.

Corollary 1

Let's note the following:

- So far we are not dealing with the notions of *space* and *time*;
- the claim of some that *a Creator of the universe "could not have existed for the simple reason that prior to creation which resulted in the very appearance of space and time there could not have been another space and time in which the Creator* acted" is an unsupported statement because the Creator could be a timeless Person from the point of view of created time, that is, it could live in a different space and time than the one resulting from creation, or simply the Creator exists in eternity, which does not mean endless time, but means the absence of time.
- A simplistic but suggestive model of the above idea is the activity of creating a software application by a programmer:
    - from nothing material the programmer builds an entire "universe";
    - the programmer's thinking, transposed into the programming environment, is the application itself;

[2] In the remainder of this paper I use the notion of "*universe*" in reference to everything that exists and "*Universe*" – capitalized – in reference to the model of universe described here.

- The space and time of the programmer are those we know, that is, those of this universe, while the space and time of the application are completely different, respectively the memory space and the frequency of the pro-cessor.

- in the paradigm of these statements we get rid of the idea of the universe being mechanically infinitely cyclical – i.e. Big Bang, implosion, Big Bang, implosion, etc. –
- the notion of a multiverse acquires another content: there is only one universe – the one conceived by the Programmer. From the point of view of the digital model, however, there can be an countable infinity of Universes with different definitions (see § Multiverses).

Since the human race has no concepts and words to describe this beginning, when there was nothing, we cannot describe creation as if we were inside it. I rely on the Bible verse (Acts 1:26-27) when I dare to believe that we have the right to try to look back at the Big Bang from the outside, as if we were witnessing how the universe was built. When asked *in what outer space and time this Big Bang occurred*, my answer is *in the space and time of thought*.

In the next chapter I will give an idea of how thinking constructs *time*.

Unlike classical models, we chose here a step-by-step construction model of *space* and *time*, a model in which *mass-energy* in the Universe is generated in parallel with *space* and *time*. So, I do not take into account the idea that the universe was born from an infinitely small, dense and hot singularity, because of the difficulties of understanding, at the physical level, the notion of singularity, even though from the point of view of mathematical analysis the notion is not alien to me. Paraphrasing Stephen Hawking, I would also ask: "*In what space and time is there this infinitely small and dense singularity that encompassed all the matter that fills the universe today, when there was still neither time nor space?*"

By my logic, I cannot accept the idea that all energy-mass of the universe already existed, in its entirety, before the creation of space and time, and then spread to the forming universe.

Hence the name *Cold Big Bang* on which I gave it to this paper in opposition to contemporary cosmology's idea that the primordial universe was extremely hot.

Brief considerations about continuous spacetime

Before proceeding to the description of a discrete pattern of *space*, *time* and *energy-mass*, I am trying to make below a critique of the application of the linear spacetime continuum in physics. At the same time I try to suggest, no more and no less, that mathematical thinking has a *time* own discreet. Failure to take this into account *time* leads, in some cases, to paradoxes.

I say that a set is discrete or countable if there is a bijective function defined on that set with values in the set of natural numbers or on a subset of natural numbers.

The Paradoxes of Zeno of Elea (about 490 b.c.. – about 430 b.c..)

Achilles paradox and the tortoise

The simplified statement would be: *How can one travel distance x, from point A to point B, as long as it is necessary to travel half of the original distance first, i.e. x/2 then it is necessary to cover half of the remaining distance, so one-fourth of the total distance, or x/4. And so on for the following distances (x/8, x/16...)?*

Suppose I met two math students at a beer gardenand asked them this question, what would they answer? Probably, on a napkin at the table would write the following:

Fie $D_n = \sum_{k=1}^{n} \frac{x}{2^k}$, n > 0, natural number; $\lim_{n\to\infty} D_n = \frac{\frac{x}{2}}{1-\frac{1}{2}} = x$; Q.E.D.

- I understand (I would say). But Zeno's deeper question was: *How is it possible that through an infinite number of actions I can travel a finite distance?*
- Here's sir, I just showed you how! (one of them would reply).
- Ok, how good it is that I invented or discovered the linear continuum! But what about that?

The paradox of dichotomy:

His statement would be: *Suppose someone wants to walk to the end of a road. Before you get there, you have to get halfway. Before they get halfway, they have to make a quarter of the way. Before traveling a quarter of the way, you must travel an eighth; before one-eighth, one-sixteenth; and so on.*

The paradox is that there is no first distance to travel, because any possible (finite) distance could be divided in half and therefore cannot be the first. So the journey can't even begin. The paradoxical conclusion, then, would be that travel over any finite distance can neither be completed nor started, so any movement must be an illusion.

Let me now resume the discussion with my much younger imaginary colleagues, on the same but simplified topic:

- Dear ones, so you can get from point A to point B.
- Categoric!
- Then it means that you can also get from B to A by going back through all the countable steps in your geometric series. What, then, is the first step from B to A?

Of course, the question was rhetorical. I waited no longer for the answer; I had also finished my beer and budget. Or... Who knows? Maybe they will answer in a future doctoral thesis.

The arrow paradox

According to Aristotle's story, Physics VI:9, 239b5

"*If everything that occupies a space equal [to itself] is at rest, and if that which is in motion always occupies such a space at all times, the flying arrow is in fact motionless*," or to put it another way: if the arrow is motionless at every moment and time is composed entirely of such moments, then movement is impossible.

The question is: two and a half millennia after the formulation of these paradoxes, during which we have developed so much mathematics and physics, can we still understand and accept these reasonings? On the road of development of science, on which we have walked, we have not left behind some unexplored paths and now it is very difficult for us to go back and ask ourselves: *What if we had thought differently from the beginning?*

These paradoxes would have no object if we were to question one of the hypotheses that Zeno used in his paradoxes, namely that between any two different points in space or time there is always another point distinct from the other two, i.e. if we drop precisely the definition the continium.

Mathematical logic paradoxes

There are several statements about objects which belong to the field of mathematics and which, developed on the basis of logical-mathematical reasoning, lead to conclusions which contradict previously stated conventions, axioms, definitions or proofs. We call these statements paradoxes. The vast majority of mathematicians assert that these statements are not logical mathematical paradoxes, but merely paradoxes generated by common language. Of course, we will never accept it that the beauty and grandeur of mathematical thinking is actually based on notions vaguely defined or introduced by axioms, that is, imposed, such as notions of *crowd* or *natural number*.[3]

[3] For example, the definition of natural numbers is based on the notions of "counting" or "ordered collection", notions that are also not well defined, being only words from common language. Of course, we can accept imposition through Peano's axioms, but they come with a "poisoned apple," which posits infinity. If we

In the end, this thinking leads to paradoxes, demonstrating once again the artificial nature of these notions.

- Here is such a statement: *Let A be the set of all abstract notions; since A is in turn an abstract notion, it follows that A is a set that encompasses itself as an element.*

The major surprise of this statement is that in just a few words we construct an object that cannot be analysed using mathematical formalism. Indeed, mathematics does not work with statements like: "Let A be a manifold with property $A \in A$". There is at least one way to avoid this paradox:

Let's introduce the following **Definition**:

1. Mathematical thinking it is a form of thinking that is included in the concept *Creatio ex nihilo* And it's consistent with logic.

Let's introduce the following: ***Axioms***:

1 Mathematical thinking creates objects of thought. The totality of objects of mathematical thinking forms the space of mathematical thought.

2 Mathematical thinking proceeds in steps that are at most countable. A step is taken when and only when, as a result of mathematical thinking, a new object or an object that can no

already know that speeds in the universe cannot be as high as possible, some of us have a hard time accepting that any natural number has a successor.

One of the definitions of set is as follows: "A collection of objects with the property that any possible object is or is not in the collection, any other variant is excluded." Any physicist of the centuries prior to the twentieth century could have thought: "Fia A is the set of all speeds less than 1010 km/s". At the level of knowledge at that time this definition is flawless; today A does not define a set because it has many elements that exceed the speed of light but, on the one hand, belong to A by definition, and on the other hand they cannot belong to A because those elements cannot be velocities. So what about the notion of a set? Do we supplement it with the fact that the collection must be well defined in any future moment of existence of the human race?

longer be analysed with the mathematical tools previously used has emerged.

I will not address here the discussion of whether creations of mathematical thinking belong to objective reality.

Definition: 2. I appoint *time* proper to mathematical thinking the sequence of steps at most countable resulting as a result of *Axiom 2*. For simplicity's sake, I will say that within this paradigm, *Time* Mathematical thinking is the set of natural numbers, supplemented by element 0, which I denote N. *Time* proper to mathematical thinking I will call it, simply, *time*.

Corollary: 2. There can be no moments or sequences of moments of time when nothing happens.

Let us resume the above statement, based on the definitions and axioms stated:

- **Time moment 0**. Enunciation: *Let be the set of all abstract notions.* So, according to *Axiom 1*, we created a new object, A_0. It can no longer be analyzed with the previously defined mathematical tools, since it would result in $A_0 \in A_0$, so, according to *Axiom 2*, I must give the clock of *time* to mathematical thinking one unit ahead.
- **Time moment 1**. The statement: *Let be the set of all abstract notions*, whether I rethink it or not, it still remains active because it has not fully consumed its effects. Resuming the reasoning, we have created a new object A1 which need not contain itself as an element, but must contain both the abstract notions considered at time 0 and A0, the newly constructed object, according to *Axiom 2* at *time* 0; thus: $A1 = A0 \cup \{A0\}$ But A1 is still an abstract notion, left orphaned in the sense that it does not belong to any other previously defined manifold of abstract notions, so again the clock must be given one unit ahead.

- **Time moment 2**. Without repeating the previous reasoning, we created the object
- $A_2 = A_0 \cup \{A_0, A_1\}$
  - •
  - •
  - •
- **Time moment n**. $\forall n \in N$. The newly created object is $A_n \in A_0 \cup \{A_0, A_1, A_2, \ldots A_{n-1}\}$

  Finally I found *The set of all abstract notions* which I will denote (by abuse of notation) with $A\aleph_0$[4]. This set can be analyzed with the tools defined so far;
- does not include itself as an element;
- includes all abstract notions considered during construction, i.e., $\forall k \in N$, $k < \aleph_0$ and $A_k \in A\aleph_0$;

➢ One last example: let proposition P be with the statement: *This proposition states about itself that it is false.*

If the sentence is false, then what it states is false, so the sentence is true. If the sentence is true, then what it states is true, so the sentence is false; we have a paradox.
Let's analyze the sentence based on the above axioms:

- **Time moment 0**. Think of a sentence with the statement: *This sentence affirms itself to be false.* Reasoning: *According to its own content, the statement is false, so it is false that the statement is false, that is, the statement is true*. This reasoning, according to *Axiom 1*, created a new object, that is, the proposition P_0 that is true, that is, its statement is true. So I went from a false statement to finding out that the statement was true. Since in mathematics a statement cannot be both false and true, we must apply *Axiom 2*,

[4] I denoted $\aleph_0$ by the cardinal number aleph 0. The concept belongs to set theory and was introduced by mathematician Georg Cantor, who defined the notion of cardinality.

that is, to give the clock of *time* to mathematical thinking one unit ahead.

- **Time moment 1**. So I'm at *time* 1 and I know P_0 is true. The reasoning: *P_0 is true that is, it is true what it states, but it states that it is false, so it is true that it is false, so it is false* leads me, according to *Axiom 1*, to the fact that I have constructed a new object, that is, the proposition P_1 which has the same statement as P_0 but which this time turns out to be false. Since a statement cannot be both false and true, I must invoke *Axiom 2*, that is, to give the clock of *time* to mathematical thought one unit ahead.

And so on, development can continue, and it can be shown by induction that P_n is true at time n even and false for odd n. The paradox has been raised because we are no longer dealing with a proposition that is both false and true.

I affirm that all logical-mathematical paradoxes can be treated on the basis of the two axioms above, that is, introducing the notion of *time* in mathematical thinking.

There is no reason to worry that mathematics should be rewritten, taking into account the two axioms. For example, geometry, according to Hilbert's axiomatization, could have at most two moments of *time*: moment 0 of the formulation of axioms and moment 1 of the creation of Euclidean space (if the last axiom were the postulate of Euclid's parallels). If a student were asked to prove that the sum of the angles of a triangle is 180^0, perhaps the student would say: *I construct some triangle and through a vertex I draw a parallel to the opposite side and then analyze the angles formed at this vertex*. In fact, the student did not build anything, the triangle and parallel already existed at moment 1, before he even drew them. In conclusion, no new objects were created, all possible geometric objects were created at time 1.

Another physics

In the previous section we were just wondering if on the road the development of science, on which we walked, we did not leave

behind some unexplored paths or maybe even introduced wrong concepts and now, it is very difficult for us to go back and ask ourselves: *What if we had thought differently from the beginning?*

- Is the universe really infinite in space and time?
- But what is infinity, what is space or time?
- Could this information, which seems to come from an earlier cycle of civilization, somehow taken from antiquity, information about extracting energy from empty space, really be true? But what about the bas-reliefs in the Dendera complex, in the temple of Hathor, and also the "eternal light", as it was called in antiquity, which apparently existed not only in Egypt but also in ancient Rome? Do we really have to accept the explanations of humanists who tell us that these are to be seen only in the light of the religious beliefs and practices of the time, at a time when we are regularly faced with energy crises? What does Nikola Tesla refer to in his work *Experiments with Alternate Currents of High Potential and High Frequency* published in THE ELE0CTRICAL WORLD, July 11, 1891 when he makes the following statement:"*Before many generations are gone, our machines will be driven by a power which can be obtained at any point in the universe*."?
- By what laws of physics are we to believe that all matter and energy in the universe has been concentrated in an (infinitely small and dense) singularity?
- In the end, what do we choose between: quantum mechanics or general relativity? And if we make a choice, what about what the other theory can explain while the chosen theory cannot?
- How is it possible that after more than two thousand years of scientific development we discover forms of existence to which we attribute the adjective "dark" just because there is darkness in our minds when we want to explain them (I refer to dark matter and dark energy)?
- Is it true the perception of some that fundamental theoretical developments are lagging behind, even though the development of technology has taken off at an unprecedented pace?

These questions and many others that I have not listed here argue for the need to develop a scientific theory that heuristically redefines basic physical concepts in a clearer, more functional and unbiased manner, free from biases such as the majority criterion, i.e. whatever the majority unconditionally accepts as true is really true, or on the criterion of rejecting any ideas that do not fit atheism.

This is exactly what this paper aims to do.

The question of the definition and physical existence of infinity was dealt with at length in the article... where we saw that the coherent definition of the notion is given by Peano's postulates, whereas in ancient thinkers this notion is defined either redundantly or is a kind of a priori notion. We consider that an infinite, whose existence is only postulated, has no place in a cosmological theory as long as we can do very well without it. In Aristotle, the continuum is well defined, but it is defined on the basis of infinity, so we do not take this into account in our theoretical development. There is no question of eliminating from mathematics these wonderful notions which are a peak and a necessity of the thinking of the human race, even if somewhere, far away, we come across paradoxes.

By definitions 1, 2 and axioms 1, 2 we have redefined the notion of time. On this basis we have managed to avoid logical-mathematical paradoxes. This redefinition of time (perhaps the word "redefinition" is not well chosen, as I don't recall ever having found a definition of time) allows us to explain, simply, why time is not reversible, as shown in the *Article...*, a demonstration that refers only to the two definitions and axioms, without invoking other arguments, such as that of the law of entropy.

In the next chapter we have redefined the notion of space through axioms 3-8 and, at the same time, defined the close relationship between space and energy-mass, a unitary

whole that has the characteristics of what standard cosmology calls dark matter. On this basis, in the following chapters, we have developed a repeating model of the construction of space, time and mass-energy. On the model of General Relativity, in which gravity is a consequence of space-time, we have developed a model of quantum gravity associated with dark-matter. We have also shown, in a separate chapter, that gravitational action generates a certain form of mass-energy which we have identified with what is now called dark energy. These theoretical developments presented in detail below have allowed us to:

- Let's prove that in a universe where space and time are discrete, there is a speed limit, according to *Article A2*.
- Let us show that the gravitational constant, in fact, depends on the average density of the universe and its age, and is decreasing, as Paul Dirac predicted in the last century.
- Let's show that space contains huge energies, even in small, seemingly empty areas of a few cubic centimetres. See *Article A1*.
- Let's recalculate the Hubble parameter, according to the *Article....*
- Let's answer the question; "If the universe is finite in space, then what is beyond it?", according to *Article* ....
- Let us show that there can be at most a countable number of universes and that each universe has a true fundamental constant related to the process of successive inflations.
- Let's prove that since the time of the early universe there can be supermassive black holes and that no black hole can evaporate as a result of Hawking radiation, according to the *Article A1*.
- Let's demonstrate formulas that calculate the growth of black holes over time and whose results agree with new astronomical observations, including those obtained with the James Webb Space Telescope. See *Article A1*.
- Since this paper is based on a discrete space and time model, we argue that in the physical reality in which we

live, infinity and hence the continuum do not exist, they are just mathematical concepts. See *Article A3*.

Recommendation: you can view the above links in a tab other than the current one, if you right-click on the link and choose "Open link in new tab", then open the new tab.

This cosmological theory has associated a digital model that simulates the generation and evolution of the universe, algorithms being programmed based on this work. The research is done based on the results emitted by the digital model.

Based on the redefinition of the fundamental notions shown above and based on the research method based on digital models, we used as the title of this chapter the expression "Another physics".

Big Bang, discrete pattern, space, time, energy-mass

I tried in the previous chapter to do the following things:

- a brief critique of models based on the linear continuum, showing that in certain situations these models make it difficult to understand physical reality, and I refer here also to the notion of singularity that appears in geometric models of gravity;
- We have shown that it is reasonable to consider that thinking based on mathematical logic can create objects of thought and at the same time be the engine of discrete *time* movement .

All this was done so that the idea presented in the introduction, namely that we live in a universe that could be a simulation, does not seem so exotic.

In this regard, I want to present a constructive model of the formation of the universe from scratch. For biological and technological reasons, this model will not be able to be developed to the current stage reached by the universe, but I believe it will be able to fill the gap of knowledge relative to the first moments of the creation of the universe.

I continue with the following axioms and definitions:

***Axioms**:*

2 The Big Bang (BB) built *space*, *time* and *mass energy step by step*.

3 *Space* It is discrete and not continuous and is formed, where the construction *Space* has ended, from indivisible units of *space*.

4 BB started from a single such unit, and not from an infinitely small, dense, hot point.

5 The physical space contains, from the very beginning, *energy-mass* And it is not a vacuum space into which matter is then poured. This primordial form of *energy-mass* I call it *dark matter (dark matter*) with direct reference to the same name in contemporary astrophysics.

6 A *unit of space* contains in formation an indivisible quantity of *energy-mass* corresponding to a frequency of $1s^{-1}$ based on Planck's formula.

7 *Energy-mass* can be moved to another *unit of space* under the following conditions:

- whether the entire amount of *energy-mass*, unit *space* The initial does not remain empty, but in it spontaneously appears the indivisible amount of *energy-mass* defined above.

In order not to begin this work with a violent violation of the principles of energy conservation, I will refer, only briefly, to the notion of *dark energy*: its appearance is the price to be paid in order to be able to build, out of nothing, the entire universe; It's like every time it applies *Axiom 8*, would slightly compress a spring that we know will come a time when it will have to relax, returning all the accumulated potential energy. *Dark energy* it is not the subject of this paper, because here I deal with the (extremely) early stages of the universe, stages in which *dark energy* still not acting. However, in the table in *Annex 2*, the accumulation of this energy is calculated step by step. The principles underlying this calculation will possibly be the subject of further work.

***Definitions**:*

3 I call *physical time* that subset of *time* proper to mathematical thinking which refers to objects arising in the thought process of BB (see previous chapter, subchapter *Mathematical logicological paradoxes*).
For simplicity, I *will call* physical time *time,* and moments of *time* I will write down with natural numbers.

4 Indivisible units of *space*, *time* and *energy-mass* I'll call them Planck units of *space*, *time* Respectively *energy-mass*, without any reference to quantum mechanics. Next I will use the abbreviations:

- **Psu** for Planck space unit;
- **Ptu** for Planck time unit;
- **Peu** for Planck energy unit.

The Ontological Principle of Digital Modeling

In a digital modeling analysis can be done based on linear continuum, but the application is done quantifying the results, this is because the continuum cannot be modeled/simulated, because it would mean modeling/simulating infinity.

The basic construction of the Universe

Among the many possibilities of repetitive geometric construction, for this model we chose the one derived from the Fibonacci number sequence, defined by recurrence relations: $F_0 = 1$, $F_1 = 1$, $F_i = F_{i-1} + F_{i-2}$, whatever $i \geq 2$, natural number. For example, for $i \leq 7$ the Fibonacci sequence comprises the numbers: 1, 1, 2, 3, 5, 8, 13, 21. An important caveat is that in most documentation of this sequence, the first Fibonacci number is 0, followed by 1, 1, 2, 3, and so on. I did not choose this option, because for the construction algorithms I use, the value 0 associated with the index 0 does not have meaning. Therefore, if you want to apply the formulas to this model of the Universe you will have to

use the definition above or keep in mind that the F_i in this paper is F_{i+1} from the usual documentation.

I made this choice because of the beauty of this construction, because of the surprising formulas that connect Fibonacci numbers to each other, and last but not least because the geometric patterns derived from this sequence are often found, at least in the living world.

Another important clarification is that the model presented here is a section of the Universe, this due to difficulties related to a priori knowledge of the geometry of space, especially of a discrete space.

Figure 1software application that generates digital models of the Universe. The figures shown are screenshots generated by this application, from which we have removed the command windows (menu, toolbar, status, etc.). When appropriate, I will present the mathematical formulas used, but without demonstration, this, on the one hand, so as not to increase the editing space, and on the other hand, to let the reader focus on the essentials.

In *Figure 1* I present the first 7 steps (corresponding to squares 1, 2, 3, 4, 5, 6, 7) of sectional development of the Universe. Fibonacci square with no. 1 is the primordial unit of *space* from which the BB started. Graphically, the side of this square is assigned a dimension in pixels. It is chosen by the user and intervenes only in the graphical interface, to transform objects, from the internal representation, to the representation defined by the screen coordinate system. All algorithms are independent of graphical context. In the images presented in this paper, the primordial unit is a square with a side of 20 pixels.

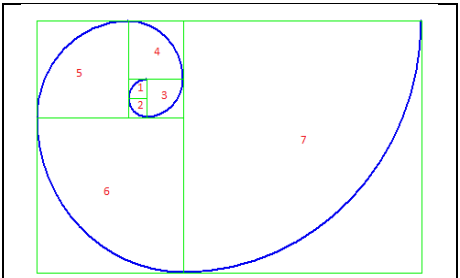


Figura 1

According to previously defined definitions and axioms, we can write:

- *Time* elapsed: 7 Ptu, Planck clock recording one unit at a time of *time* for the construction of each Fibonacci square (1, 2, 3, ... , 7);
- *built space* : 273 Psu (sum of areas of all 7 constructed squares, i.e. sum of squares of Fibonacci numbers, starting with iteration 0 through 6: $1^2 + 1^2 + 2^2 + 3^2 + 5^2 + 8^2 + 13^2 = 273$ Psu;
- *the mass-energy* of the Universe at this moment is 273 Psu 1 Peu/ Psu = 273 Peu, ie: $273 \cdot 6.6260755 \cdot 10^{-34}$ J;
- *Information* used so far to build the piece of the universe in *Figure 1*: we go through the Fibonacci sequence starting from the index i = 0. Square no. 1 in the figure is the Planck unit of *space* Primordial. From the upper-right corner of the square we

build an arc with radius F_0, to the opposite corner so that the arc drawn counterclockwise is inside the square.

For i = 1: at the end point of the arc from the previous step we take the tangent to the arc and in the direction indicated by the arc we build a segment with length F_1. On the perpendicular to this segment, carried to the free point of the segment, in the direction of the previously built arch, we take a segment also with length F_1. We close square no. 2 adding the missing segment. At the end of this step we construct the arc, with radius F_1, from the end point of the previous arc to the opposite point of square no. 2.

For i = 2, 3, 4, 5, 6 we always repeat the algorithm from the previous step, obviously the values of the radius of the arcs and the length of the segments will be F_i.

***Definitions**:*

5 Fibonacci spiral drawn in *Figure. 1* with arcs and blue color, I'll call it *Aur of Spirala*, although it is an approximation of the golden spiral as defined in literature. The end point of the first arc of *spiralei de aur* I'll call it *The absolute construction center* of the universe, and the end points of the other arcs the voi numi *relative centers of construction* of the universe. From the primordial unit (square No 1 of *Figure 1*) three more gold spirals can be built, as shown in *Figure 2*. The developments generated by the four spirals push *Space* in four cardinal directions. As a result, I will baptize after cardinal points (E, N, W, S) these *Spiral of aur* who are the true builders of the model of the Universe shown here.

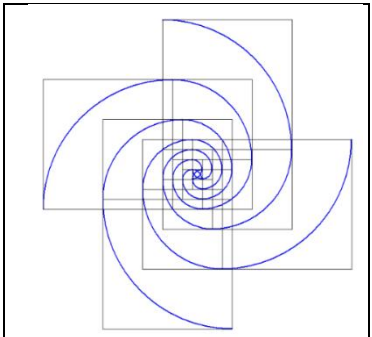


Figura 2

6 I call number *Iterations* of the basic construction of the universe, the last index of the Fibonacci number used in the construction algorithm.

Cosmological inflation

Within the model described here, no matter how many steps it takes *the basic construction of the Universe,* it will not contain enough *energy-mass* leading to the formation of billions of observable galaxies. Besides *Space* it would remain made up of larger and larger cells as the Fibonacci string indices advanced. As a result, we have introduced the hypothesis here *Inflation*, inspired by the standard cosmological model, generally accepted today.

Definition*:*

7. *Inflation* it is the process of permanently continuing the generation of the universe. The growth/development of the Universe is done in *Inflation* Successive. After the completion of the basic construction follows the first *inflation*; It consists of a construction similar to the basic construction, carried out this time in each *Relative construction center of the universe.* As a result of this process, new gold spirals are generated. Following *inflation* It follows the same rule, that is, each end point of arc becomes *relative building center of the universe*, for each arc of each golden spiral generated in a *inflation* Previous. A spring end can be one-time *relative center of construction.* Each *inflation* will have the same number of *Iterations* with that of the basic construction.

If the process of generating the first inflation, described above, seems too brief to you, then I will continue with the following clarifications: from the point of view of the digital model, in a relational database that preserves all the constructive and dynamic elements of the Universe, there is a table that preserves the arcs of circles that form the spirals (as soon as an arc is built it is stored in a record of the table). Let's go back to Fig. 1: the absolute center of construction is the lower left corner of square 1, relative building center No. 1 is the lower-right corner of square 2. Repeating the basic construction at this point is equivalent to translating a copy of the spiral in Fig. 1 so that the lower

left corner of square 1 of the copy overlaps the lower right corner of square 2 of the original. Relative Building Center No. 2 is the upper-right corner of square 3. We make a new copy of the original in Fig. 1, then translate to the lower left corner of square 1 of the copy in the upper right corner of square 3 of the original, and so on to the last relative center of construction, in our case no. 6 inclusive. That's how we're done with the South spiral. For the East spiral, as you may suspect, I will rotate the entire previous construction, counterclockwise, around the intersection of the diagonals of square 1 and $\pi/2$. Similarly, the remaining 2 spirals were resolved. With this implementation inflation 1 s-a terminated.

The construction *of inflation* with the number n > 0 means the launch of the basic construction algorithm for all spring heads generated during *inflation* n-1.

Figure 3 is equivalent to *inflation* No. 0.

In *Figure 3* the end of the first is shown *inflation*, applied only to the partial construction displayed in *Figure 1*. Of course the first *inflation* had to be applied to the basic construction displayed in *Figure* 2; I did not do so, because the resulting image would be too dense and therefore complicated to understand. We can see some square cells with a side of 1 Psu already constituted and the extension *Space* versus the basic construction.

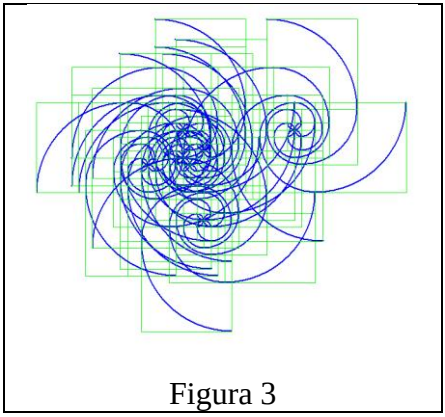


Figura 3

According to *Axioms 6 and 7*, *inflation* adds *energy-mass* additional, or in other words, heats *Space*.

Definition*:*

8. I appoint *definition of the universe* pair of natural numbers C|I where C is the number of *iterations* of the basic construction, and I is the number of *Inflation*.

Based on the above, *Figure 2* shows a universe with definition 6|0.

Inflation Add more to your existing model *space*, *time* even more *energy-mass*. I will present some formulas:

- the time duration of inflation with the number k=0, 1, 2, 3, ..., I is:

(1) $$T_k = c1\ 4^{k+1}(C+1)^{k+1}$$

Where c1 = 1 Ptu is a constant (ensuring consistency of units of measurement); for k = 0, T_0 is the duration of the basic construction of the universe or, based on this formula, inflation 0;

- Age The universe with the definition C|I will be:

$$T_{total} = \sum_{k=0}^{I}(T_k + Ŧ_k),$$

where $Ŧ_k$ is the time elapsed after the end of inflation k and until the next inflation, or until the last moment of life of the universe in question, time accumulated as a result of other processes to be described later;

- *energy-mass* generated in *time inflation* k is:

$$ɗ_k = c_2\ 4^{k+1}\ F_C\ F_{C+1}\ (C+1)^k$$

where $c_2 = 1\ \frac{Peu}{Psu^2 Ptu}$ is a constant; for k = 0, $ɗ_0$ is *energy-mass* generated in *time* basic construction.

It is interesting that, taking into account the formula (1) it can be written:

(2) $$ɗ_k = c_2\ \frac{F_C\ F_{C+1}}{C+1}\ T_k$$

Recall that the notation F_i represents the Fibonacci number of index i. As a result, *the total mass-energy* of the Universe with the definition C|I will be:

(2') $$M_{total} = \sum_{k=0}^{I}(ɗ_k + ɸ_k)$$

$ɸ_k$ being *energy-mass* accumulated after the end of inflation with no. k, as a result of other processes that will be described later.

Some clarification is still needed regarding the units of measurement. The construction of this model starts from natural numbers that are not initially associated with physical quantities. During the development of the model, some concepts expressed quantitatively by numbers receive physical interpretations that are assigned, depending on the context, units of length, mass or *time*. For

example, Fibonacci numbers are interpreted here as lengths; F_i where $i \epsilon N$ are interpreted as the lengths of the sides of Fibonacci squares that build a section of the universe, as shown above. To compensate for this shortcoming, we chose the artifice, unit constants c_1 and c_2.

Note that formula (2) shows a connection between *space* (F_C and F_{C+1}), *time* and *energy-mass*.

One of the many interesting properties of the Fibonacci sequence is that the sequence $\left\{\frac{F_n}{F_{n-1}}\right\}_{n\epsilon N, n>1}$ has a limit and $\lim_{n\to\infty} \frac{F_n}{F_{n-1}} = \varphi$ which is the famous golden number; it can also be defined as the positive solution of the equation $\varphi^2 - \varphi - 1 = 0$ and has the value $\varphi = \frac{1+\sqrt{5}}{2}$. If we multiply and divide the formula (2) by F_C, we get:

(2'') $$\mathfrak{d}_k = c_2 \frac{F_C^2 \frac{F_{C+1}}{F_C}}{C+1} T_k \approx \varphi \frac{F_C^2}{C+1} T_k$$

We have assigned to φ the units of c_2.. In the sequence defined above, the element with index 14 already approximates the golden number to the fifth decimal place, and the accuracy increases as the index increases.

The formula (2") shows a connection between *space*, *time*, *energy-mass* and the golden number.

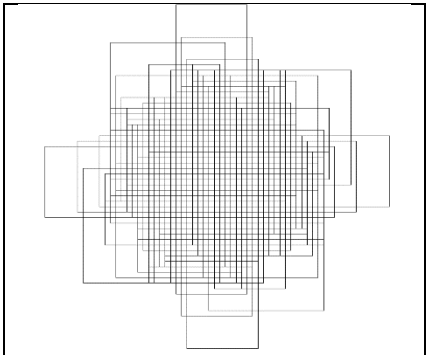


Figura 4

Figure 4 represents the end of inflation in the model with definition 6|1. In this figure were omitted golden spirals. Basic construction was featured in *Figure 2*. After applying the first inflation, the model became more complex and apparently more cells were formed. *space* equal in size to the primordial unit, denoted by no. 1 in *Figure 1*. What is seen in the figure is actually an overlap of the F_i squares generated by the construction algorithm. The appearance of small square cells, all of which have the same length of side, is not forced by the construction

software algorithm, but results simply as a result of applying inflation to the base construction. It can be shown that, whatever a cell and a Fibonacci square is, the cell can either be included in or outside the square, partial overlaps being excluded.

Definition*:*

9. I appoint *Phase transition* the process by which the section of the universe generated by basic construction and inflation is completely divided into elementary cells of *space*. Each cell receives, according to *Axiom 7*, a quantity of *energy-mass* i.e. 1 Peu for each Fibonacci square (F_i) in which the cell is included, or in other words, from the overlapping cells results a single cell that will receive the sum of the quantities of *energy-mass* of overlapping cells.

From *Figure 4* it can be easily deduced that the cells on the edge of the section, which obviously belong to a single square, will be associated with 1Peu.

Figure 5 represents graphically the result of application *phase transition* for a universe with the definition 6|1.

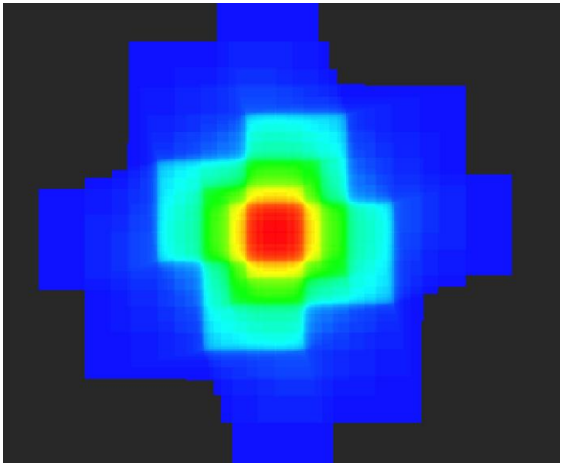


Figura 5

It is evidenced by color shades, the decreasing distribution of *energy-mass*, on the scale red, yellow, green, blue and blue. Rasterizing the image is the effect *phase transition* who shared *Space* in indivisible and individualized cells. *Space* built is just the concave polygon in the image; The black

background has no meaning, it is just the rest of the display surface used[5].

Distance

I write down QS and call it *space* quantum, the set of all cells resulting from *phase transition*.

I define the function: d: $QS^2 \longrightarrow (\{F_n\}_{n\epsilon N})^4 \cup \{(0,0,0,0)\}$ where $\{F_n\}_{n\varepsilon N}$ are Fibonacci numbers and $\forall$ (a,b) ϵ QS^2, d(a,b) = (d_1, d_2, d_3, d_4) where d_1, d_2, d_3, d_4 are the sides of the Fibonacci squares where cell b is found in each of the four developments generated by the gold spirals S, E, N and W, starting from cell a (v. *Definition 5*).

In *Table 1* values of the function d are given for several values assigned to arguments, for a universe with definition 6|3.

id_qs1	id_qs2	d1	d2	d3	d4
1	2	1	5	3	2
1	3	8	5	3	2
1	4	8	5	3	13
…	…	…	…	…	…
2	1	3	2	1	5
2	3	1	5	3	2
2	4	8	5	3	2
…	…	…	…	…	…
3	1	3	2	8	5
3	2	3	2	1	5
3	4	1	5	3	2
…	…	…	…	…	…
4	1	3	13	8	5
4	2	3	2	8	5

[5] In this way I also answer the question: *If the universe is finite, then what exists outside of it?* The answer is: *If the Person or Consciousness who builds the universe by thinking about it puts nothing into what we call "outside," then this "outside" exists only in our imagination.*

4	3	3	2	1	5
…	…	…	…	…	…

Tabelul 1

In the internal representation of the digital model, each cell belonging to QS is assigned a natural number in the order of cell generation by the algorithm: *phase transition*. In the first column, the cells taken as a basis are listed, that is, those from which the four spirals start. In the second column are the other cells, and in the last four are listed the Fibonacci numbers, that is, the sides of the Fibonacci squares where the cell is found *id_qs2* in developments starting from *id_qs1* in directions S, E, N, and W. By abuse of language it could be said that the table below lists the four coordinates of *id_qs2* in a landmark originating in *id_qs1*. I said by *abuse of language*, because the four coordinates are not independent, so the plane section in which we work does not have four dimensions. Indeed, the following theorem can be proved:

Theorem 1

Whatever the definition of the Universe and $\forall$ (a,b) ϵ QS^2, a $\neq$ b, such that d(a,b) = (d_1, d_2, d_3, d_4), unde d_1, d_2, d_3, d_4 ϵ $\{F_n\}_{n\epsilon N,}$ atunci d(b,a) = (d_3, d_4, d_1, d_2,).

The proof of this and subsequent theorems is not included in this paper, for the reasons already stated. Let's study this result more closely, using an analogy: let be, in the Euclidean plane Oxy, points a(a_x, a_y) and b(b_x, b_y), a $\neq$ b. Using the above notations, let d'(a, b) = ($b_x - a_x$, $b_y - a_y$) coordinates of b with respect to a and d'(b,a) = ($a_x - b_x$, $a_y - b_y$) coordinates of a with respect to b. Suppose that for various reasons we do not want to work with negative numbers, and we should find another method of writing coordinates when changing the frame of reference. Without question, one possibility would be this:

(i) $d'(a,b) = (b_x - a_x, b_y - a_y) \stackrel{def}{=} (b_x, b_y, a_x, a_y)$

(ii) $d'(b,a) = (a_x - b_x, a_y - b_y) \stackrel{def}{=} (a_x, a_y, b_x, b_y,)$

Of course the analogy of definitions (i), (ii) with *Table 1* it only goes up to a point; For example, in (i), when b_x, b_y go through the set of real numbers, a_x, a_y remain invariable. This partial analogy suggests to me the definition of a new function. Under the conditions of the definition of function d at the beginning of this subchapter define:

D: $QS^2 \longrightarrow R^2$ such that $\forall$ (a,b) ϵ QS^2, D(a,b) = ($|d_1 - d_3|$, $|d_2 - d_4|$), where d(a,b) = (d_1, d_2, d_3, d_4)

I define for $\forall$ x ϵ QS, D(x,x) = (0,0). (I always put this condition because I didn't include the number 0 in the string $\{F_n\}_{n\epsilon N}$).

The magnitude of the difference of two Fibonacci numbers is generally not also a Fibonacci number. Fortunately for the coherence of this digital model, the following remarkable theorem can be proved:

Theorem 2

Given the definitions in this subchapter, whatever the definition of the Universe is and $\forall$ (a,b) ϵ QS^2, a $\neq$ b such that d(a,b) = (d_1, d_2, d_3, d_4), then: ($|d_1 - d_3|$, $|d_2 - d_4|$) ϵ $(\{F_n\}_{n\epsilon N})^2$.

Before we go any further, I present in *Figure 6* A screenshot showing the first phases of building the 6|1.

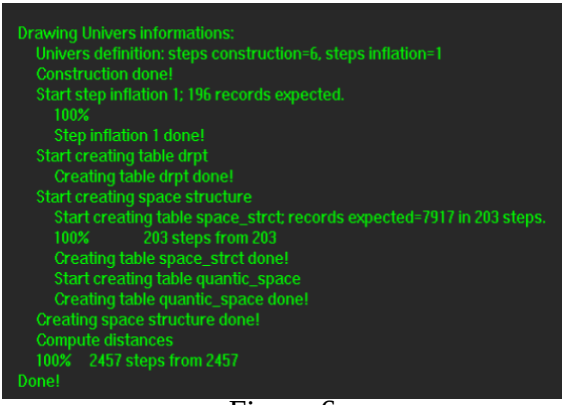


Figura 6

- Rows 2 and 3 refers to the beginning of the well and the end of the basic construction of the University (v. §Basic construction).
- Row 4 refers to the generation of inflation premium (v. §Cosmological inflation). According to formula (1), it lasts T_1 = 784 Ptu. According to *Corollary 2*, something happens in every Planck unit of time, and building this *something* requires processing time in

the digital model. Designing the inflation algorithm, we found a shortcut that allows inflation to be calculated only in the direction E (v. *Definition 5* and *Figure 3*) and then extrapolate to the remaining three directions, N, W and S (see *Figure 4*), saving processing time. For this reason, only 196 records are listed in Figure 6, i.e. 784/4.

- The algorithm continues with the creation of two tables with intermediate data, *drpt* and *space_strct*, and then the algorithm dealing with *phase transition* and *quantum space* respectively comes into action (see §Phase transition and *Figure 5*).
- Since the distance d function between cells of *quantum space*, defined at the beginning of this chapter, is used a huge number of times and in order not to calculate it over and over again, at the end of this phase the complete table of all distances is constructed, a table similar to *Table 1*.
- Finally, the 6|1 universe has, so far, the following characteristics:
  - Age = $T_0 + T_1 = 28 + 784 = 812$ Ptu.
  - Total *energy-mass* = $ɗ_0 + ɗ_1 = 31668$ Peu.
  - No. of cells of *quantum space* = 2417.

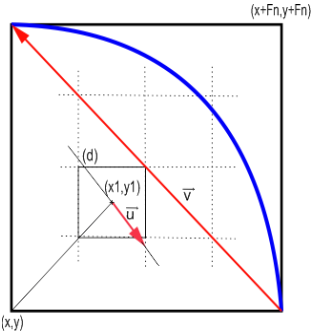
Trigonometric quantum gravity

In this chapter I will present *Gravitational interaction* between *mass-energies* resident in cells *Space* Quantum. In order to operate with known notions, I will assume that over the section of the universe generated so far by the digital model, I can stretch a two-dimensional linear continuum that, at least in portions, can be assimilated to surfaces of the Euclidean plane.

Defining *gravitational interaction* Trigonometric consists of the following steps:

- For each cell of *quantum space*, to denote it abbreviated z, we will calculate *the gravitational interaction* with all other cells, for each of the four directions of development of golden spirals: E, N, W, and S starting from z (v. *Definition 5*).
- For each cell of quantum space, the result of the calculation will be a vector (in the Euclidean plane of the section of the Universe)

- Let (x, y) be the starting point of a Fibonacci square of index n generated by one of the four golden spirals, say E. For each cell in the Fibonacci square, construct the vector $\vec{u}$ as shown in *Figure 7*, as follows:
  1. Let be any cell in the Fibonacci square marked in *Figure* 7 by the small square drawn with continuous lines.
  2. Let (x1, y1) be the center of this square.
  3. Point (x, y) is the center of the blue arc that is part of the spiral E. The drawing direction of the arc is from the right/bottom corner to the left/top corner of the large square and is also the sense of the vector $\vec{v}$, defined as shown in the figure.
     - Construct the line (d), perpendicular to the point (x1, y1) on the line passing through points (x, y) and (x1, y1).
     - In the direction of the line (d), in the opposite direction of the vector $\vec{v}$ construct the vector $\vec{u}$ (cos($\vec{u}$, $\vec{v}$) < 0).



- Figura 7

Definitions (10; 11)*:*

10. We define the vector module $\vec{u}$ thus: $\|\vec{u}\|$ = K $\frac{EM_z}{{F_n}^2}$, where EM_z is the mass-energy concentrated in cell z, F_n is Fibonacci number of index n (or the side of the Fibonacci square of index n generated by the spiral E), and K is a constant of proportionality such that the unit of measurement of $\|\vec{u}\|$ be $\left[\frac{Psu}{Ptu^2}\right]$. Note that in the Fibonacci square of index n there will be ${F_n}^2$ vectors with the same modulus resulting from *gravitational interaction* with *energy-mass* concentrated in cell Z.
11. We will call the constant K the *gravitational constant*.

4. Repeat the algorithm in points 1. – 3., for all cells that make up Fibonacci squares generated by the E spiral starting from z. Then the same algorithm repeats for each of the remaining three spirals: N, W and S, also starting from z.
5. Repeat the algorithms in points 1 to 4 for all cells of *quantum space*. In this way, in the center of each cell, there will be 4 · (p-1) vectors (9664 vectors for definition 6|1), where p is the number of cells of quantum *space*.
6. For each cell, these vectors are added together to obtain a field of p vectors that describes: *Gravitational interaction* between *energy-mass* resident in quantum space cells.

Gravitational constant

In classical mechanics, the gravitational constant has a value of $6.67408 \cdot 10^{-11}$ $\left[\frac{m^3}{kg \cdot s^2}\right]$ and is defined as numerically equal to the force of gravitational attraction between two masses of one kilogram, one meter apart. Whereas in this digital model value is very important *gravitational constant* for calculating some parameters of the universe, a definition like "In this model, the value of the gravitational constant is numerically equal to *Gravitational interaction* between *mass-energies* resident in two cells of *space* quantum at a distance of 1 Psu and charged each with 1Peu", if they cannot compute, or experimentally deduce its value. As a result, I will work with an empirical calculation formula:

Definition 12**.**

I define the calculation formula of *gravitational constant* in the International System of Units as follows:

(3) $$K_{SI} = (\pi^2 \cdot \delta \cdot T_{total}^2)^{-1} \left[\frac{m^3}{kg \cdot s^2}\right]$$

where δ is the average density of the universe and T_{total} is its age.

As can be seen, the density is expressed in kg/m^3. Since I have not yet defined the notion of mass, according to the formula defining the equivalence between energy and resting mass, I will replace the

notion of mass with *Energy-Masa* divided by the maximum possible speed in the Universe.
In order to be able to apply *Definition 12* I will have to complete the notion of "section of the universe" used in paragraph 3 of chapter § *The basic construction of the Universe* in the sense that, in order to speak of density in Planck units of measurement, the section of the universe must be three-dimensional by assigning a height of 1 Psu to each cell of quantum space. The vector calculus described in the previous chapter will be done in a median plane of this section. In this context I will note $\delta_{Planck}=\frac{M_{total}}{N_{total}}$ where M_{total} is the total *mass-energy* of the universe and N_{total} is the total number of cells of *quantum space*, each cell being a cube with a volume of 1 Psu^3. Since we do not work with the notion of mass and in order to maintain compatibility with the formula (3), we assign to M_{total} units of measurement $\left[\frac{Peu\ Ptu^2}{Psu^2}\right]$. Recall that the formula of equivalence between energy and rest mass, written in Planck units of measurement, shows numerical equality between energy and mass since in this context the speed of light is 1 $\left[\frac{Psu}{Ptu}\right]$. With these, the formula (3) is written in the Planck system of units of measurement, adopted here, in the form:

(3') $$K_{Planck} = (\pi^2 \cdot \delta_{Planck} \cdot T_{total}^2)^{-1} \left[\frac{Psu^5}{Peu\ Ptu^4}\right]$$

If we perform all the transformation calculations between the two units of measurement, it follows:

(3") $$K_{Planck} = \|K_{SI}\| \cdot 507.57261 \cdot 10^{-35} \left[\frac{Psu^5}{Peu\ Ptu^4}\right]$$

Where I denoted $\|K_{SI}\|$numerical value of , without units of measurement. For example, for the current universe $K_{Planck} = 3.3875802 \cdot 10^{-43} \left[\frac{Psu^5}{Peu\ Ptu^4}\right]$.
At the Lindau Nobel Laureate Meetings in 1979, Paul Dirac chose to speak on a subject that had preoccupied him for over 40 years, the so-called Large Number Hypothesis of 1937. In his lecture, Dirac assumed that age the universe and the gravitational constant have always been inversely proportional. From this he draws a number of

interesting conclusions. One of them is that the gravitational constant varies with age the universe and is shrinking. Another of his hypotheses from 1937 is that mass the universe is proportional to the square of the age of the universe. Since the mass of the universe increases with time, this last hypothesis of Dirac is at odds with the classical Big Bang hypothesis which states that all matter in the universe was originally concentrated in the primordial singularity.

The formulas (2") and (3) are consistent with Dirac's hypothesis but, a bit backwards, that is, according to the formulas, *energy-mass* the universe is proportional to age to the universe, not with the square of age, and *gravitational constant* it is inversely proportional to the second power of the age of the universe and not to its first power.

To be able to play a little with the above formulas we will first have to assign numerical values to some fundamental constants:

$$K_{SI} = 6.67408 \cdot 10^{-11} \left[\frac{m^3}{kg\ s^2}\right] = \left(\pi^2 \cdot \frac{M_u}{V_u} \cdot T_{total}^2\right)^{-1}$$

Mu and Vu are the mass and volume of the Universe. Number of seconds in a year (S_{ca}) = 365.2425 · 24 · 60 · 60 = 31,556,952 seconds/year;

Speed of light = 299,787,989.40 m/s;

T_{total} = 13.8 · 10^9 ani= 13.8 · 10^9 · S_{ca} s = 4354859376 · 10^8 s;

$V_u = \frac{4}{3}\pi \cdot (46 \bullet 10^9$ light years$)^3$ = 3.45215224 · 10^{80} m^3 =

= 8.17676 · 10^{184} Psu^3;

Mass of the sun = 1.989 · 10^{30} kg;

Proton mass = 1.673 · 10^{-27} kg;

Obviously, all these values are constantly updated according to the evolution of theoretical models and measuring and observation equipment. As a result, the above numerical values are purely informative.

=> $M_u = \frac{V_u}{\pi^2 \cdot T_u^2 \cdot K_{SI}}$ kg = 2.763 • 10^{54} kg = 1.389 • 10^{24} mase solare

or 1.65152420800956365809922295277 94 • 10^{88} protons;

$=> \delta = 4.784 \left[\frac{protoni}{m^3}\right]$, this being the average density of our universe for which all forms of existence have been taken into account, i.e. dark matter, dark energy and concentrations of dark matter – *proto-particles*, all of which are defined in the following chapters.

In *Annex 1* where the evolution of a Universe with the number of iterations is analyzed 9, you can see the slow decrease of *gravitational constant* as time evolves. What is not seen from this table, but results from the digital model, is that this decrease is not uniform over time, but slows down as the universe ages. If for this definition of universe, or for any other, the construction algorithms were to continue long enough, a value of *gravitational constant* very close to that of the real universe and if *energy-masa* total and age If the digital universe were close to those of the real universe, then there would be a very good chance that the digital model was almost a 1 to 1 copy of the real universe. This is obviously impossible because nothing can process faster than the "engine" of the evolution of the universe, namely Creative Consciousness Itself. As a result, there will always be a huge time lag between the development stage of the digital model and the real universe, not to mention the technical impossibilities of making the proper computer and our biological limitations.

Energy-mass dynamics

Figure 8 show *space* quantum with definition 6|2 to which the field of vectors that *describes the gravitational interaction* between *energy-mass* resident in cells *Space*. Judging by the direction and meaning of the vectors, we could predict that the entire content of *space* It is engaged in a vortex that would have the effect of gravitational collapse at the center of the masses. This is not exactly the case. Even though due to the huge computational times I can only address extremely small definitions of universes, I expect that *energy-mass* (i.e. *dark matter*) not to concentrate only in the center of the masses, but to have multiple centers of concentration. In addition, I expect the organization of *dark matter* in filaments. Otherwise, the digital model described here would have little chance of describing the first moments of the real universe.

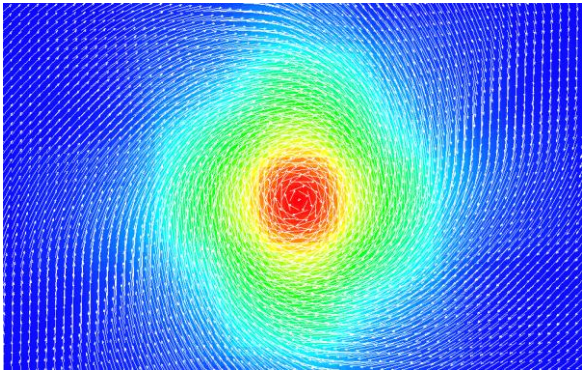


Figura 8

Figure 9 shows the four possibilities of transfer of *dark matter* in the central cell, depending on the direction and direction of the vector $\vec{u}$ of *gravitational action*. This migration will be done according to *Axiom 8*. In addition, the transfer will be made only in a remote cell of 1 Psu. The only candidate cells to receive *dark matter* transferred are: 1 on development S, 2 on development E, 3 on development N, or 4 on development W. Cells 5, 6, 7, and 8 are found at distances ≥ 2 for either development. If the vector $\vec{u}$ passes through a corner of the cell, since I don't know which of the surrounding cells to transfer to *dark matter*, we chose not to make any transfer. For the models of the Universe we were able to tackle, we found no situation where vectors $\vec{u}$ pass through corner neighborhoods with a radius of less than 10^{-8}, in the internal coordinates of the digital model.

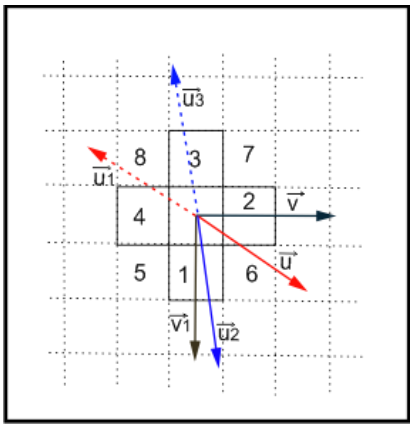


Figura 9

Transfer algorithm *dark matter* It's simple:

- define vectors $\vec{u}$ and $\vec{v}$ parallel to coordinate axes, of any mode and oriented as in the figure;
- The transfer will be made in cell 2 if $\cos(\vec{u}, \vec{v}) > \frac{\sqrt{2}}{2}$
- The transfer will be made in cell 4 if $\cos(\vec{u}, \vec{v}) < -\frac{\sqrt{2}}{2}$
- The transfer will be made in cell 1 if $\cos(\vec{u}, \vec{v}) > \frac{\sqrt{2}}{2}$
- The transfer will be made to cell 3 if $\cos(\vec{u}, \vec{v}) < -\frac{\sqrt{2}}{2}$

Definitions:

13 Name *stage* the process by which *dark matter* from all cells *space* quantum is moved over a distance of 1 Psu under the action of the vector field describing *gravitational*

interaction. Taking into account the order in which matter is transferred between cells in *space* quantic, a *stage* it begins with the movement of matter in the first cell and ends after the movement of matter in the last cell. Because *dark matter* It is constantly in motion, crossing cells *space*, the end of a *stage* coincides with the beginning of another. *Stages* take place in t*ime* unobtrusive and as a result are countable.

14 Complete *Definition 8* thus: I call the definition of the universe the triplet of natural numbers C|I|S where C is the number of iterations, I is the number of inflation and S is the number of the last *stage* development.

Now we can return to the definition, left in suspension, of the parameter $Ŧ_k$. This is the sum of the development *stages* that took place between k and k+1 inflation.

Using formulas from uniformly accelerated motion with initial speed, from classical mechanics, we can write the formula that results in the length of *time* in which the transfer is performed for each cell:

$$t = \frac{V - V_0}{\|\vec{u}\|} = \frac{\sqrt{V_0^2 + 2 * \|\vec{u}\|} - V_0}{\|\vec{u}\|},$$

where V_0 is the speed at which *dark matter* entered, in *stage* previously in cell *space* which we are analyzing, and V is the speed printed at the output of this matter as a result of the action of the vector $\vec{u}$; see also *Definitions 10* and *11*. In the previous formula, the space traveled does not appear explicitly, since it is equal to the distance between two neighboring cells, that is, 1Psu. Obviously, for *stage* n_o 1, $V_0 = 0$.

According to the algorithm described above, for any given cell of *space*, *dark matter* can be transferred in any of the E, W, N, S directions, with the exception of cells on the edge of the Universe. Obviously, the reverse is also true, that is, any cell can receive *dark matter* from any of the four directions. As a result, the digital model takes into account that *energy-mass* four speeds can be assigned from each cell, one for each direction.

Energy-mass dynamics depends essentially on three elements:

1. *Axiom 8.*
2. The order in which the transfer is made.
3. Accuracy of calculations.

Without *Axiom 8* everything ends very quickly in a few *stages*, eventually the Universe becomes completely empty, except for primordial unity of *space*.

The order in which the transfer is made *dark matter* between cells *space* quantum depends on all the elements defined so far: on the distance function, on the definition t*ime*, speeds, *gravitational constant* and the algorithm for calculating vectors of *gravitational interaction*. In addition, this order in which the transfer is made in conjunction with *Axiom 8* determines the place and timing of *time* the occurrence of an indivisible quantity of *dark matter* (*v. Axiom 7*) to be added to the mass of total of the universe.

Without a very high precision of calculations – which depends on the number of exact digits that the CPU can provide to the computer on which the simulation is performed – the entire processing becomes chaotic, worthless, after only a few dozen *internship*s.

Annex 2 shows the dynamics of transfer *energy-mass* or *dark matter (v. Axiom 6)* between cells *space*, in a universe with definition 6|1|15. The completion of the transfer, shown in the table, has the effect of switching to *stage* next, i.e. to definition 6|1|16.

The transfer is made from cell id_qs1 to id_qs2 in the time shown in the Time column. The transferred quantity is indicated in the transferred Dark matter column. The units of measurement are those according to Definition 4.

Principle of symmetry

Analyzing the dark matter transfer tables between successive *stages*, a certain symmetry based on the figure 4 can be observed. For example, in *Canvas* 2:

- the number of simultaneous transfers is multiples of 4; for transfers made in 11 Ptu it is $1 \cdot 4$, the same for transfers made in 18

Ptu and for simultaneous transfers made in 24 and 25 Ptu the number is $2 \cdot 4$;

- the quantity of *dark matter* transferred within simultaneous transfers is the same for each group of 4 transfers.

Number of cells *Space* quantum containing the same amount of *dark matter*at any time of *time*, is divisible by 4; These cells are organized in two pairs, the cells of each pair being symmetrical with respect to the absolute center of construction (v. *Definition 5*), forming a kind of force couples, namely the vectors defining *Gravitational action* They have the same module and are in opposite directions in parallel directions. It makes the whole *dark matter* to rotate slowly, around *The absolute construction center*, with different angular velocities.

I allow myself to discuss concepts of classical mechanics based on linear continuity, based on §The Ontological Principle of Digital Modeling and the assumption made at the beginning of the subchapter §Trigonometric quantum gravity.

This type of symmetry is explained by the fact that the Universe is built by the 4 possible golden spirals that depart from each *Relative construction center* (v. *Definitions 5 and 7*). What is not seen in tables and images is another, deeper symmetry in which the number 4 is involved, namely the four-step repetition of algorithms for constructing the universe even through a single golden spiral.

First cuantifice

Let's go back to *Annex 2* and to analyse it from another perspective, Thus, it is legitimate to ask: if the first transfer was made in the first 8 Ptu then, in light of *Corollary 2* What happened in the moments of *time* from 1 to 7? Based on §The ontological principle of digital modeling Transfer calculations of *dark matter* were made in floating point, then the results relating to *time* have been rounded to the nearest integer, preserving the order in which transfers were made (order given by *Times* calculate in floating point). Based on the same principle, in the column *QTime*, consecutive natural numbers, starting

with 1. In this way *Times* have been quantified, considering that they are *Times* true to the model of the universe and not those coming from floating point calculation.

The last transfer was made after 515 Ptu quantified and this *time* has been added to age Universe.

On the other hand, let's not forget that transfers are made between cells of *space* at distance 1 Psu (see comments on *Figure 9*); it follows that in the Universe there is a maximum transfer rate of *dark matter* and this is equal to 1 $\frac{[Psu]}{[Ptu]}$. In addition, a velocity quantization results, the only possible transfer values are of the form $\frac{1}{n}$, $n \in N$, $n \neq 0$.

Even $\overrightarrow{V_1}$ and $\overrightarrow{V_2}$ two quantized velocities acting in the same direction and in the same direction, then the result of their composition $\overrightarrow{V_r}$ will have the modulus:

$$V_r = \frac{V_1 + V_2}{1 + V_1 \cdot V_2}$$

If we consider that 1 Psu = $1.616229 \cdot 10^{-35}$ m and 1 Ptu = $5.39124 \cdot 10^{-44}$ s, then it $\frac{1\ Psu}{1\ Ptu}$is the speed of light in vacuum. Obviously, the fact that we found this value is related to how the two Planck units were correlated with each other when they were defined.

Since we finally now have a clearer picture of this model's proposal for how universes are constructed, we could anticipate the definition of the physical universe we live in. Thus, we say that our universe could fit in, in terms of age, the amount of matter and *gravitational constant* in one of the models with definitions between 95|24 and 110|22. An accurate analysis could be made when developing this model will allow the calculation of quantities φ_k and $Ŧ_k$ defined in §Cosmological inflation, as well as the number of cells of *quantum space*. At the present *stage*, these quantities are known only after the conclusion of the algorithms for building the Universe. Even if we had a supercomputer, one that processed at "the speed of

our universe," we would have to wait billions of years before we knew the quantities listed above.
Really:

- based on *Definition 3;*
- based on *Formula (1)*;
- based on the convention that 1 Ptu = $5.39124 \cdot 10^{-44}$s
- taking into account as 1 year = 31,556,952s

it follows that for a universe with the definition of 99|23, the processing time of inflation 23 alone would be: $T_{23} = 4^{24} \cdot 100^{24} \approx 2.814749 \cdot 10^{62}$ Ptu = $15.175 \cdot 10^{18}$ s = 480.8767 billion years. Similarly, it can be calculated that inflation 22 ends when the universe is 1.2052 billion years old. If we only took into account the age universe, it would be reasonable to assume that we live in a universe with definition 99|23 and at this point our universe would be in the early *stages* of inflation 23 (*v. Annex 3*).

If there were a formula by which we could calculate no. cell of *space* quantum according to the definition of the universe, then we could calculate the average density even further *gravitational constant*. By analyzing the digital models of various definitions of universes that we have been able to calculate so far, we could approximate the values of variables φ_k and $Ŧ_k$, for every inflation k considered, and we could find what are the definitions or definition of the Universe for which at age 13.8 billion years, *gravitational constant* it's the one in our universe today. In this way, I think it would fill many gaps in the knowledge of the early universe.

Dark energy

So far, only a brief reference has been made to the need to introduce the notion of *dark energy* to save, at all, the principle of conservation of energy when applied *Axiom 8* as a result of *gravitational action* (v. §Big Bang, discrete pattern, space, time, energy-mass).

If geometric models of the universe have accustomed us to the notion of space-time continuum, this work refers to a unitary space-

time-energy-mass whole whose nature is discontinuous. In order to operate with this unitary whole, we divided it into two:

- The first is *time*, an element that has more to do with the nature of our thinking than with physical reality (vv. *Definitions 2 and 3*);
- the second is *space-energy-mass* which defines, no more and no less, than *dark matter*, as characterized in contemporary cosmology.

We have defined Quantum gravity Trigonometric acting on quantified quantities of energy-mass from cells of quantum space, previously the process of space and energy-mass formation was defined, but without starting from an infinitely small and dense singularity. A special place has it Axiom 8 which, in short, says that if gravity moves the entire amount of mass energy out of a cell of space, that cell does not remain empty, but in it instantly appears the indivisible amount of energy-mass which we have called the Planck unit of energy-mass (Peu). In this way we assigned to each space cell two amounts of energy, expressed by natural numbers, as follows:

- The first starts from 0 and increments by one unit whenever applied *Axiom 8* to that cell; This amount of energy I will call *dark energy*; this form of energy occurs exclusively during the *stages* of development of the universe (see §Energy-mass dynamics and *Definition 13*)
- The second amount of energy is the sum of the *dark energy* and the *mass-energy* accumulated as a result of the basic construction of the Universe and cosmological inflations (see §Cosmological Inflation) as well as the *mass-energy* moved into the respective space cell as a result of the *gravitational interaction* applied at each *stage* of development. In a word, this second amount of energy stores the total energy associated with the respective cell at a given point in time.

Energy-masa accumulated as a result of the basic construction of the Universe and inflation is made as a result of *Axiom 7* and does not fit as *dark energy*.

Let's return to the formula (2'); Recall that this formula calculates *energy-mass* total of a universe with the short definition C|I, $ↄ_k$ is *energy-mass* generated during inflation k = 0, 1, 2, ..., I. The term $φ_k$ whose explanation was left hanging, we can now define it, namely it is *energy-masa* accumulated between k and k+1 inflation as a result of *gravitational action* and application *Axiom 8* in the *stages* between the two inflations. In other words, $φ_k$ is *dark energy* accumulated between k and k+1 inflation. Noting $φ = \sum_{k=0}^{I} φ_k$ *dark energy* total accumulated as a result of *gravitational interaction* at all *stages* of development of the universe, the formula (2') can be written:

$$M_{total} = \sum_{k=0}^{I} ↄ_k + φ$$

According to the above, *dark energy* is really a form of energy that is part of the whole *energy-mass* of the universe. *Dark energy* is resident in cells of quantum space and is included in *energy-mass* total. As a result *dark energy* is part of *dark matter*, according to all previous definitions.

Based on this new information, let's reconsider the table in *Annex 1*:

- the short definition of the universe is 9|2 so C = 9, the associated Fibonacci number $F_C = 55$, $F_{C+1} = 89$;
- according to formula (1):
  - T0 duration of basic construction = $41\ (9 + 1)^1 = 40$ Ptu;
  - T1 duration of first inflation = $42\ (9 + 1)^2 = 1600$ Ptu;
  - Age the universe is T0 + T1 = 1640 Ptu;
- according to formula (2):
  - $ↄ_0 = \frac{55 \cdot 89}{10} \cdot 40 = 19580$ Peu;
  - $ↄ_1 = \frac{55 \cdot 89}{10} \cdot 1600 = 783200$ Peu;
  - $φ_0 = 0$ by definition;
  - energy-total mass at the end of the first inflation (end *stage* 2) is $M_{total} = ↄ_0 + ↄ_1 = 802780$ Peu.

- Between *stages* 3 – 66 only accumulate *dark energy* worth 3199256 Peu – 802780 Peu = 2396479 Peu = = $\sum_{k=3}^{66} \varphi_k$ (as noted in this paper), φ_k Being *dark energy* accumulated in *stage* k, which is equal to the difference between *energies-masses* totals between *stages* k and k-1.

- $\mathfrak{d}_2 = \frac{55 \cdot 89}{10} \cdot T_2 = \frac{55 \cdot 89}{10} \cdot 64000$ Peu = 31328000 Peu which represents *energy-masa* generated by second inflation during the *stage* 67. This amount is added to the total *energy-mass* of heading 66 of *stage* and obtain the value from item 67 from which the second inflation begins. Similarly, increases the Universe age studied here.

Traditional cosmology associates *dark energy* with the relative voids of matter in the structure of the universe. In *Annexes 9, 10, 11* these voids, marked in dark blue, can be seen, indicating that *energy-masa* of those cells has only a few Peu. In the model discussed in this paper, these voids arise exclusively as a result of: *gravitational action.*

The fundamental constant of the Universe

According to axiom 7 of the paper, a space cell, at formationcontain *o energy-mass* equal to 1 Peu or, in the International System of Units (SI), $6.6260755 \cdot 10^{-34}$ J.
Let a Universe with C iterations, formula (2') can be written as:

$$\frac{\mathfrak{d}_k}{T_k} = c2 \frac{F_C^2 \frac{F_{C+1}}{F_C}}{C+1} \approx \varphi \frac{F_C^2}{C+1}$$

where $c2 = 1 \frac{Peu}{Psu^2 Ptu}$ and φ is the golden number to which we assigned the units of measurement of c_2, F_C is the Fibonacci number associated with the index C and k = 0, 1, 2, 3, ... inflation number. Note that the ratio $\frac{\mathfrak{d}_k}{T_k}$ is constant whatever k, therefore I will generalize this result:

Corollary 3

For a given universe, variation *energy-mass* produced by inflation how long inflation lasts is a constant that depends only on the definition of the universe:

$$\frac{\Delta \mathfrak{d}}{\Delta T} \approx \varphi \frac{F_C^2}{C+1}$$

Here's a remarkable new result: we have a clear constant and what a constant, one that includes the golden number, whereas, as we've seen, *gravitational constant* It is not actually a constant, it depends on *energy-mass* and age The universe (vv. *Definition 12*).

Let's go back to *Annex 1* and highlight this constant for the Universe described there:

- For inflation 0, that is, for the basic construction of the Universe with *Iteration* 9 follows: $\frac{\Delta \mathfrak{d}}{\Delta T} = \frac{19580}{40} = 489.5$; on the other hand: : $\varphi \frac{F_C^2}{C+1} = \frac{1+\sqrt{5}}{2} \cdot \frac{55^2}{10} = 489.45528 \approx 489.5$
  or: $\frac{F_C \; F_{C+1}}{C+1} = \frac{55 \cdot 89}{10} = 489.5$
- For inflation 1 (*stages* 2 -1),
  results: $\frac{\Delta \mathfrak{d}}{\Delta T} = \frac{802780-19580}{1640-40} = 489.5$
- For inflation 2 (*stages* 67 to 66), it follows:
  $\frac{\Delta \mathfrak{d}}{\Delta T} = \frac{802780-19580}{1640-40} = 489.5$

Let us now calculate a conversion formula between the units of measurement Peu/Ptu and J/s (W):
starting from the definitions: 1 Peu = $6.6260755 \cdot 10^{-34}$ J and 1 Ptu = $5.391245 \cdot 10^{-44}$ s, it follows:

$$\frac{1\,Peu}{1Ptu} = \frac{6{,}6260755 \cdot 10^{-34}}{5.391245 \cdot 10^{-44}} \frac{J}{s} \approx 1{,}2290 \cdot 10^{10}\ \text{W}$$

I will choose from *Annex 3* a definition of the universe. The choice is made according to age in the sense that the universe with the definition 110|22|1 is of age of 13.285 billion years after inflation number 22, an age very close to that of today's universe that could be at the beginning of inflation 23 (with the same number of iterations i.e. 110). The criterion of choice is extremely arbitrary in the absence of knowledge *gravitational constant* for the definition of 110|22|1, as shown in the comments listed at *Annex 3*. In the absence of a more reliable definition of the current universe model, I will work with this:

- C = 110;
- F_{110} = 7515661444929089378

- $\varphi = \frac{1+\sqrt{5}}{2}$

According to *Corollary 3* and the above conversion formula, it follows:

$$\frac{\Delta \text{ɗb}}{\Delta T} \approx 1.01193 \ 10^{\cdot 46 \text{ W}},$$

This is the power generated by any inflation in a Universe with 110 iterations. In other words, under the assumption of permanent sequences of inflation, $1.01193 \cdot 10^{46}$ J of energy is generated in the Universe every second, plus dark energy.For the definition of 110|22|1 *the total energy-mass* expressed in solar units of energy is of the same order of magnitude as the total mass, expressed in solar masses, calculated for our universe in the chapter §Gravitational constant, but they are different units of measurement.

Energy pipelines

The dark matter dynamics algorithm described in the comments made to *Figure 9* shows the four directions in which matter can move, starting from any cell of *quantum space*.

We know that for everything *stage* can be calculated gravitational action vectors, and on this basis, it yields a table like the one listed in Annex 2, which shows for each cell, where and how the transfer is made dark matter. On an image of *space* quantum, we can figure this transfer by horizontal or vertical vectors, from one cell to another, see *Annexes 6, 7, 10*. These images suggest a network of *energy pipelines* through which matter circulates. At the beginning of the Universe's development, these vectors are oriented according to the four cardinal points (vv. *Definition 5*). In confluence zones where vectors of different directions meet, filaments of *dark matter* from which concentrations can then form (see next chapter).

It is interesting to analyze situations where in a cell of *space* there is a *compression of matter*, that is, matter enters on one, two, three or four sides of a cell without leaving there, as seen in *Annex 6*.

Proto-particle

Universes up to *Iteration* 6 (vv. *Definition 6*) including, irrespective of the number of *inflation* and associated *stages*, creates a

single concentration of *dark matter* in the middle of the universe, perhaps, some kind of Planck particle. From *Iteration* 7 And upwards there are an increasing number of symmetrically arranged concentrations of matter, four at a time, relative to the center. In addition, as the number of inflation increases, so does the number of quadruples of concentrations.

Spatially these concentrations look like a square with a side of two space cells. These cells are unevenly filled with dark matter that is rotating clock wise between the four cells. Initially these systems of four, as the number of *stages* increases, move slightly towards the centre, fall apart and then rebuild in several *stages* and finally settle into their final positions. The four-systems remain in constant rotation and absorb the matter around them, becoming over time the main centres of absorption, stronger than the central area of the Universe.

As a result of Axiom 8, the amount of dark matter in these four-systems is constantly increasing, even after the matter previously in the area has been consumed. Using various quantum space visualisation filters or by analysing energy manifolds, it can be seen how matter locally swirls around the four-systems, forming a kind of accretion zone, and is eventually absorbed by the four-system.

Definitions:

15. These systems of four are called proto-particles.

Fortunately there is a counterweight to growth, in *time*, without measure of the amount of *dark matter* in a *space* very small, namely in four cells. This is the decrease in value *gravitational constant*, *stage* with *stage* (v. Gravitational constant and § *Annex 1*). Without this decrease *proto-particle* would exercise after a *time* a *gravitational action* huge that would create chaos in the universe. Instead, due to the decrease *gravitational constant Proto-particles* have mainly local influence.

Comment:

In this paper I dealt with the early stages of the Universe in which notions of *energy-mass* and *dark matter* we considered them synonymous. As the universe ages, due to the

permanent accumulation of *dark matter* in *proto-particle* as well as due to the phenomenon of *Compression*, presented in *Pad* 6, new objects appear, qualitatively different from anything that existed before, such as baryonic matter, and *Black holes*.

Axiom 8 and the informational paradox of the black hole

As Stephen Hawking pointed out in the 70s, thanks Quantum uncertainty *Black holes* radiates a small amount of heat, called "Hawking radiation", and in doing so loses mass and eventually evaporates. The evaporation over time of black holes leads to a paradox: anything that falls into a black hole will be lost forever, thus violating the principle of information unity of quantum mechanics which says that the present always retains information about the past.

Axiom 8, which is the central element of this paper, applied to this case, states that even if a black hole absorbed all the baryonic matter in the area, it would still have something to consume, namely *dark matter* of cells *Space* quantum which, according to the axiom, is an inexhaustible spring. As a result, a black hole will never evaporate and, on the contrary, will continuously accumulate mass reaching the size of the supermasses we assume exist at the centers of galaxies. I suppose this phenomenon is the missing process that explains how some very old black holes become supermassive.

11.11.2023~18.01.2024, James Webb Space Telescope has discovered a supermassive black hole, as heavy as stars in its galaxy, that formed 470 million years after the Big Bang. The research was published in the journal Nature Astronomy.

Multiverse

According to *Definition 14*, n, m, p ε N, n > 1, p> 0, there can be a universe with the definition∀ n|m|p. Since any universe thus defined is evolving, i.e. parameters m and p can grow independently of each other, it follows that in this definition, the determining parameter is n, and the other two parameters m and p show the level of development of that universe. It follows that, from the point of view of this model, there can be a countable infinity of universes, that is, the cardinal of the set of all

The possible universes is aleph 0 (see Footnote 2).
Chart *3* shows the characteristics of several universes according to their definition.

ANNEXES

Annex 1 - Evolution of the Universe from definition 9|0|1 to 9|2|363.

Sta-giul	**Total *dark matter Peu***	**Vârsta Univer-sului Ptu**	**Nr. celule *spațiu* cuantic**	**Constanta *gravita-țională* K_{SI}**	**Constanta *gravita-țională* K_{Planck}**	**Nr. infla-ției**
1	19580	40	11741	7.48E+27	3.80E-05	0
2	802780	1640	41449	3.83E+23	1.95E-09	1
3	834072	4008	41449	6.18E+22	3.13E-10	1
4	865232	5382	41449	3.30E+22	1.68E-10	1
5	896668	6794	41449	2.00E+22	1.01E-10	1
6	928788	8305	41449	1.29E+22	6.56E-11	1
7	961552	9960	41449	8.67E+21	4.40E-11	1
8	994912	11797	41449	5.98E+21	3.03E-11	1
.	,	.	.	.	.	.
66	3199256	333922	41449	2.32E+18	1.18E-14	1
67	34527256	397922	88981	3.25E+17	1.65E-15	2
68	34607748	419684	88981	2.91E+17	1.48E-15	2
69	34688536	441028	88981	2.63E+17	1.34E-15	2
70	34769680	462171	88981	2.39E+17	1.21E-15	2
71	34851120	483129	88981	2.18E+17	1.11E-15	2
72	34932896	504021	88981	2.00E+17	1.02E-15	2
73	35014916	524767	88981	1.84E+17	9.35E-16	2
74	35097132	545482	88981	1.70E+17	8.63E-16	2
.	,	.	.	.	.	.
357	59601508	6677120	88981	6.68E+14	3.39E-18	2
358	59688992	6699190	88981	6.63E+14	3.37E-18	2
359	59776480	6721257	88981	6.58E+14	3.34E-18	2
360	59863988	Figure 1	88981	6.53E+14	3.31E-18	2
361	59951500	6765427	88981	6.47E+14	3.29E-18	2
362	60039012	6787509	88981	6.42E+14	3.26E-18	2
363	60126516	6809586	88981	Figure 2	3.23E-18	2

Annex 2 - Shows the total of 24 events representing the dynamics of dark matter transfer from id_qs1 to id_qs2, for definition 6|1|15. Qtime is the quantized time. The number of simultaneous events is a multiple of 4.
[Dark matter transferred] = Peu.

id	id_qs1	id_qs2	Time	Qtime	Dark matter transferată	Dark energy acumulată
1	1021	1020	11	1	1323	7
2	1143	1206	11	1	1323	7
3	1275	1212	11	1	1323	7
4	1397	1398	11	1	1323	7
5	1020	1083	18	2	774	6
6	1206	1207	18	2	774	6
7	1212	1211	18	2	774	6
8	1398	1335	18	2	774	6
9	959	958	24	3	481	7
10	1079	1142	24	3	481	7
11	1339	1276	24	3	481	7
12	1459	1460	24	3	481	7
13	683	727	24	3	256	8
14	846	845	24	3	256	8
15	1572	1573	24	3	256	8
16	1735	1691	24	3	256	8
17	960	959	25	4	422	8
18	1016	1079	25	4	422	8
19	1402	1339	25	4	422	8
20	1458	1459	25	4	422	8
21	639	683	25	4	234	8
22	847	846	25	4	234	8
23	1571	1572	25	4	234	8
24	1779	1735	25	4	234	8

Annex 3 - Given the examples of Universes with tiny definitions computed so far, one might question whether this model can explain the age and enormous amount of matter in the observable Universe. As a result, we have calculated from formulae (1) and (2) for $\varphi_k=0$, various definitions of Universes with larger iterations. Unfortunately, at this time I do not have a formula that allows the calculation of the number of cells of a quantum space that would lead to the immediate calculation of the average density and then the gravitational constant. For now, the only way to find this number is to process the full quantum space construction algorithm after each inflation.

1 solar unit = mass of the sun · speed of light squared.

Gravitational constant = K_{Planck}

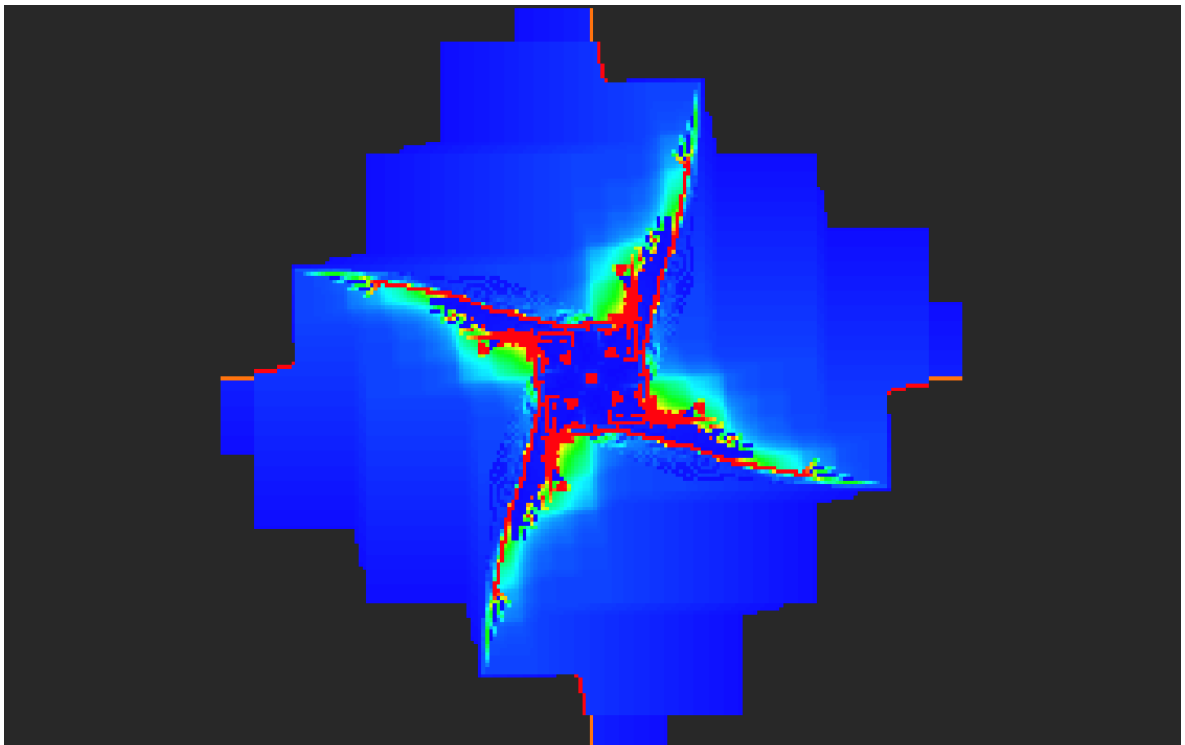
Universe definition	Total energy-mass	Universe age	Gravitational constant
8|3|790	390,494.188 Peu	9,737,351 Ptu	1.57e-19
9|2|363	960,126,516 Peu	6,809,586 Ptu	3.23e-18
50|24|1	2.698e-04 solar units	9.451e-03 billion years	?
70|24|1	1.731e+08 solar units	36.90 billion years	?
90|22|1	1.154e+14 solar units	0.137 billion years	?
95|22|1	4.603e+16 solar units	0.471 billion years	?
100|22|1	1.729e+19 solar units	1.515 billion years	?
104|22|1	1.909e+21 solar units	3.701 billion years	?
104|23|1	8.021e+23 solar units	1554 billion years	?
105|22|1	6.159e+21 solar units	4.602 billion years	?
105|23|1	2.611e+24 solar units	1951 billion years	?
110|22|1	2.087e+24 solar units	13.285 billion ears	?

Annex 4 – Presented a table describing the accumulation *dark matter* (v. *Axioma* 8) as well as the complete rotation in 8 Ptu (2 Ptu x 4 *stages*), carried out over 4 *stages* of a *proto-particlein system four*, (v. §Proto-particles) arranged in four units of *space* generically named ID_alias 1, 2, 3, 4 so that 1 is the upper-left corner, 2 bottom left, 3 bottom right. These generic units correspond to: *Space* quantum IDs 4668, 4669, 4788 and 4787 of definition 8|1|233 through 8|1|245. I noted QTime *Time* Quantify.

Stage	**ID_alias**	**Moved to**	**ID**	**E/M of ID_alias**	**QTime**	**Total E/M**
233	1	4	4668	143560	1	319213
	2	1	4669	78439	1	
	3	2	4788	15020	1	
	4	3	4787	82194	**2**	
234	1	4	4668	78733	1	320589
	2	1	4669	15021	1	
	3	2	4788	82874	**2**	
	4	3	4787	143961	1	
235	1	4	4668	15022	1	321516
	2	1	4669	83044	**2**	
	3	2	4788	144526	1	
	4	3	4787	78924	1	
236	1	4	4668	83221	**2**	323292
	2	1	4669	145866	1	
	3	2	4788	79182	1	
	4	3	4787	15023	1	
237	1	4	4668	146185	1	324533
	2	1	4669	79813	1	
	3	2	4788	15024	1	
	4	3	4787	83511	**2**	
238	1	4	4668	80107	1	325910
	2	1	4669	15025	**2**	
	3	2	4788	84192	3	
	4	3	4787	146586	4	

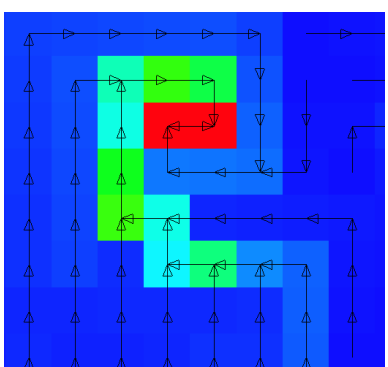
Stage	ID_alias	Moved to	ID	E/M of ID_alias	QTime	Total E/M
239	1	4	4668	15026	1	326832
	2	1	4669	84362	**2**	
	3	2	4788	147146	1	
	4	3	4787	80298	1	
240	1	4	4668	84539	**2**	328606
	2	1	4669	148484	1	
	3	2	4788	80556	1	
	4	3	4787	15027	1	
241	1	4	4668	148787	1	329831
	2	1	4669	81187	1	
	3	2	4788	15028	1	
	4	3	4787	84829	**2**	
242	1	4	4668	81450	1	331177
	2	1	4669	15029	1	
	3	2	4788	85510	**2**	
	4	3	4787	149188	1	
243	1	4	4668	15030	1	332099
	2	1	4669	85680	**2**	
	3	2	4788	149748	1	
	4	3	4787	81641	1	
244	1	4	4668	85857	**2**	333872
	2	1	4669	151085	1	
	3	2	4788	81899	1	
	4	3	4787	15031	1	
245	1	4	4668	151406	1	335115
	2	1	4669	82530	1	
	3	2	4788	15032	1	
	4	3	4787	86147	**2**	

Annex 5 def. 7|3|403 – filter 1000. At every *inflation* one tooth is added to the oblique edges of the Universe.

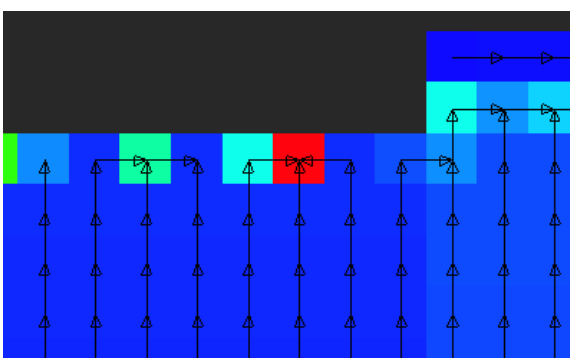


Annex 6 - Various situations of matter compression.

Definition 8|1|233
Matter is collected from its surroundings and concentrated in the red cells, never to leave.

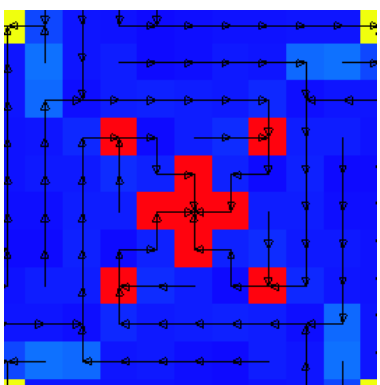


Definition 7|1|74 - filter 600
Image from the edge of the Universe. Matter channelled through 1, 2 or 3 inputs.

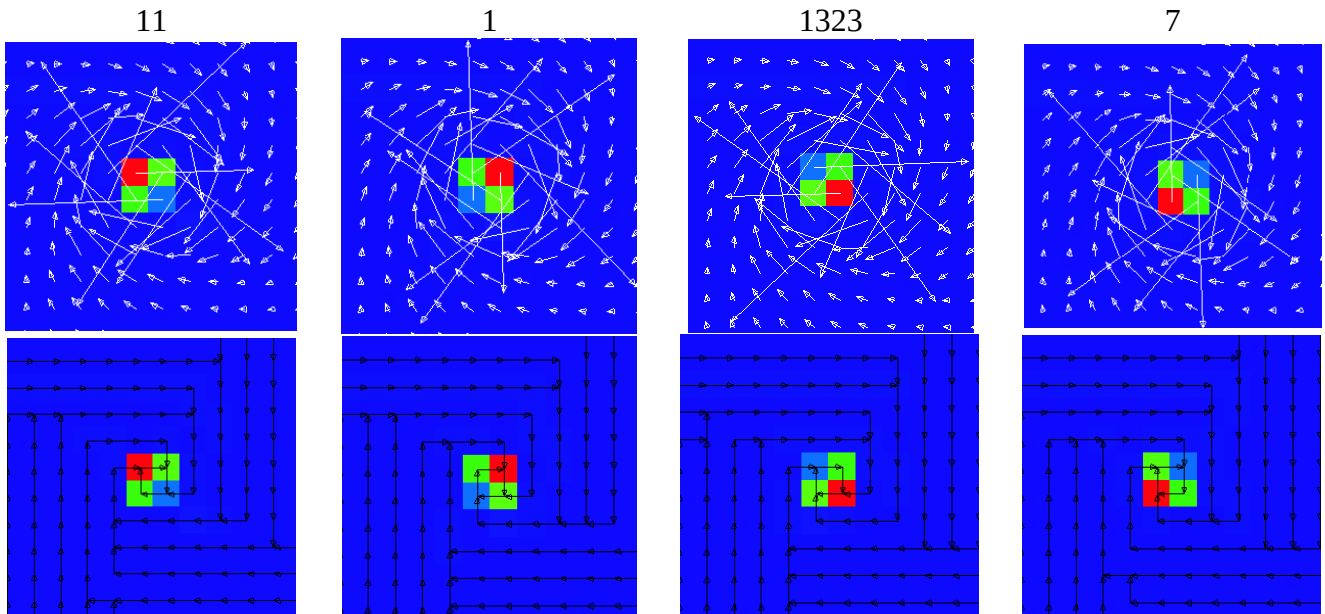


7
Definition 7|1|37 - filter 600

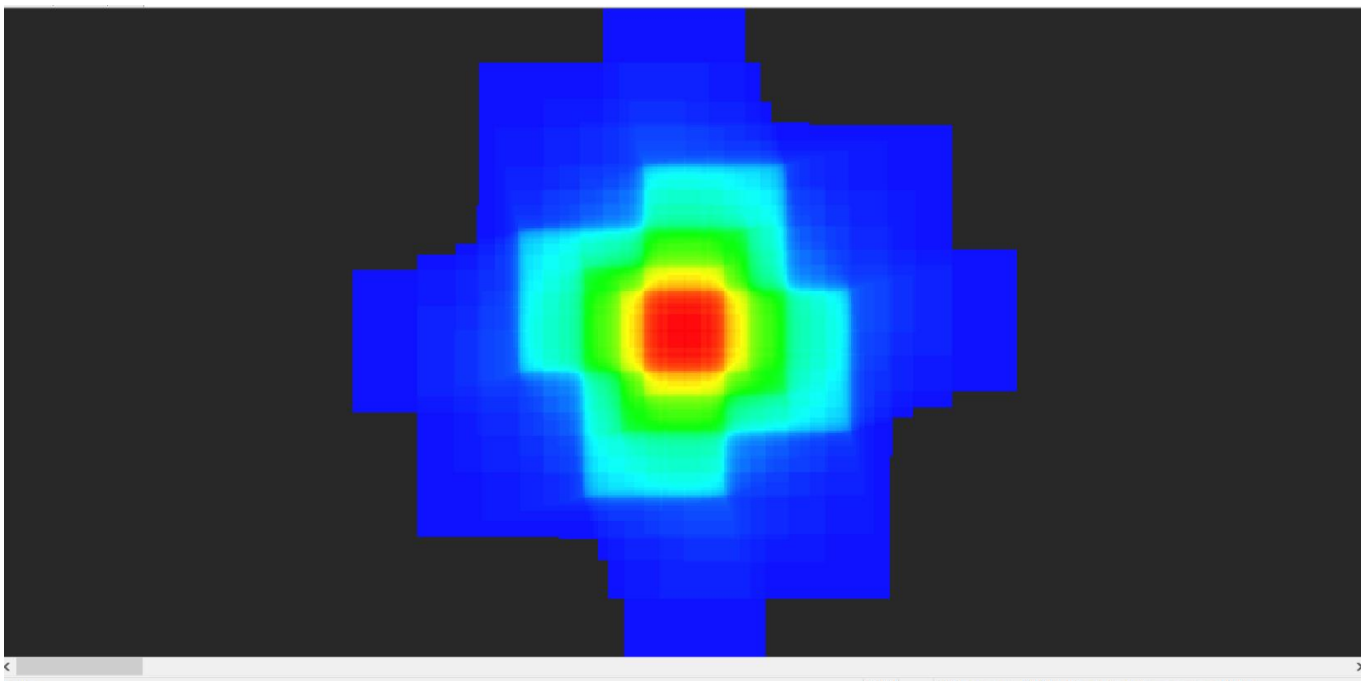
Image of the central area of the Universe. Matter channeled through all 4 inlets, never leaving that cell.



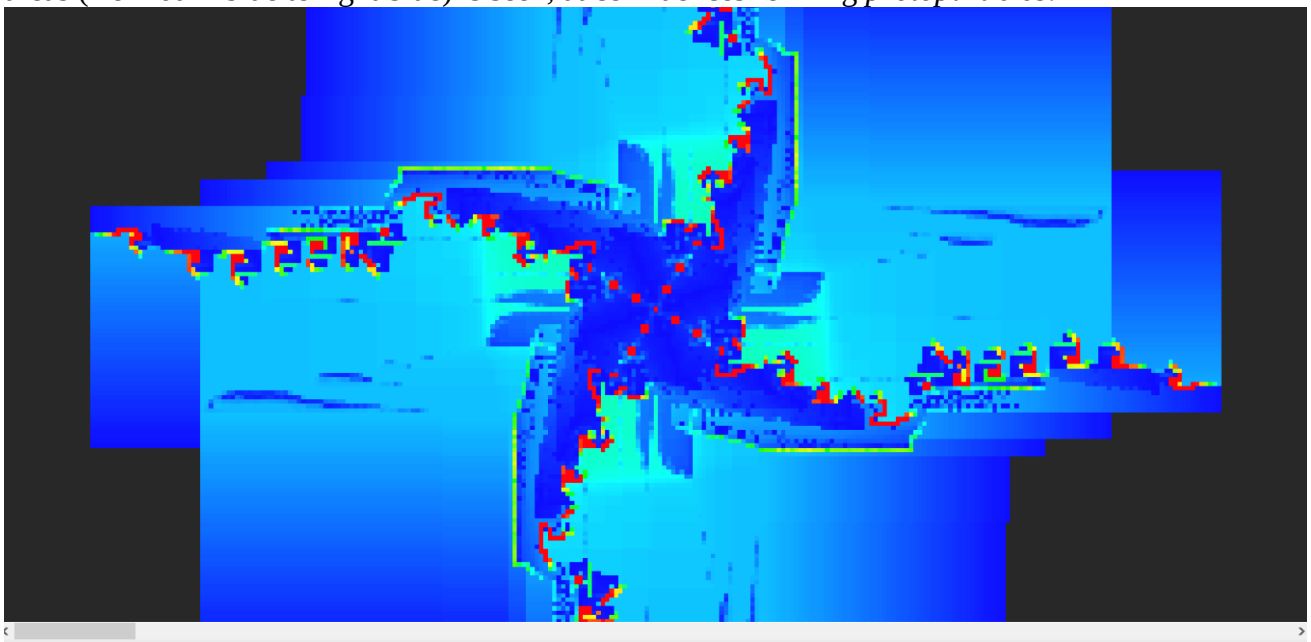
Annex 7 – Graphical evolution of the *proto-particle* whose dynamical elements were shown in *Annex 4*.
8|1|236 The universe age at *stage* 233 is 824,422 Ptu.



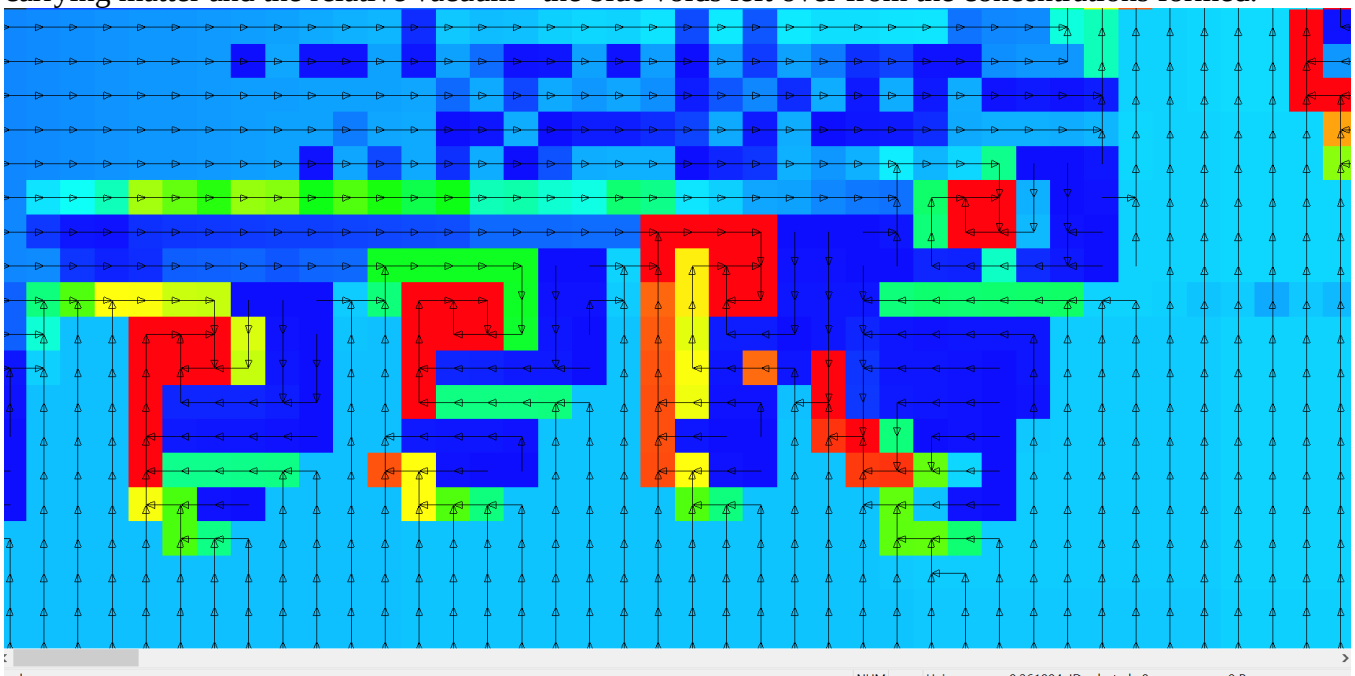
Annex 8 def. 9|1|1 – without filter. The end of the first inflation, before *gravitational interaction* begins to shape the primordial universe. The hottest areas are in the center.



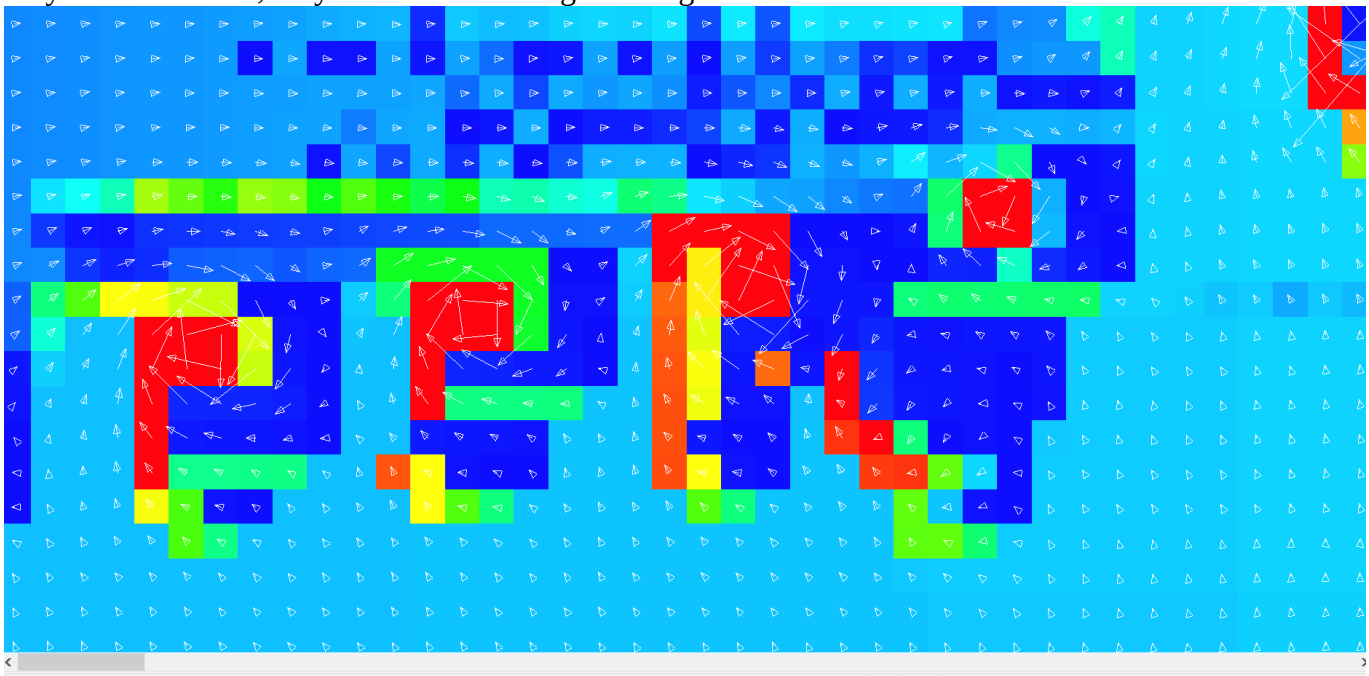
Annex 9 def. 9|1|57 – filter 300. The central area where the result of transporting matter from edge to central areas (from dark blue to light blue) is seen, at confluences forming *protoparticles*.



Annex 10 def. 9|1|57 – filter 300, detail. You can see the granulation of quantum space, the energy buses carrying matter and the relative vacuum - the blue voids left over from the concentrations formed.

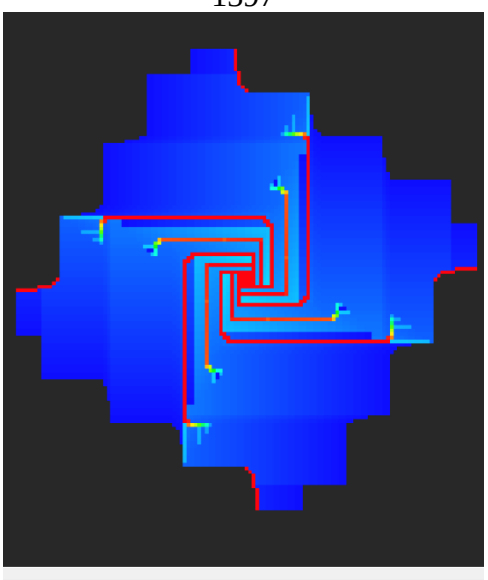


Annex 11 def. 9|1|57 – the previous detail showing the vectors of gravitational action. For vectors with very small modulus, only the arrow showing meaning was drawn.

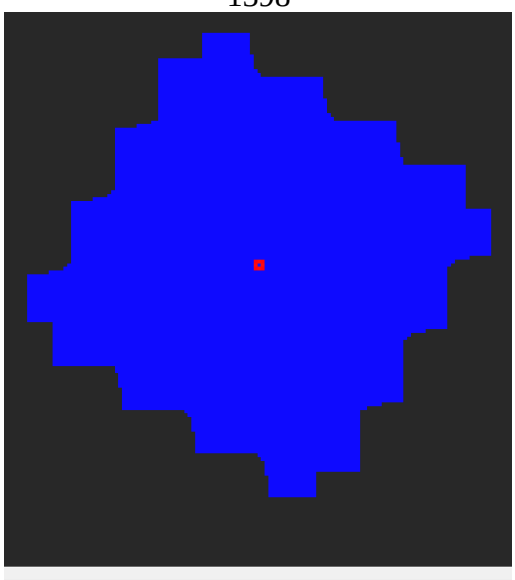


Annex 12. Universes with no. of iterations Below 7 forms at the center a single giant proto-particle that continuously absorbs matter. These universes are too small relative to the intensity of gravitational action power plants that are too large to allow the formation of other centers of accumulation besides matter stuck on the border.

1397

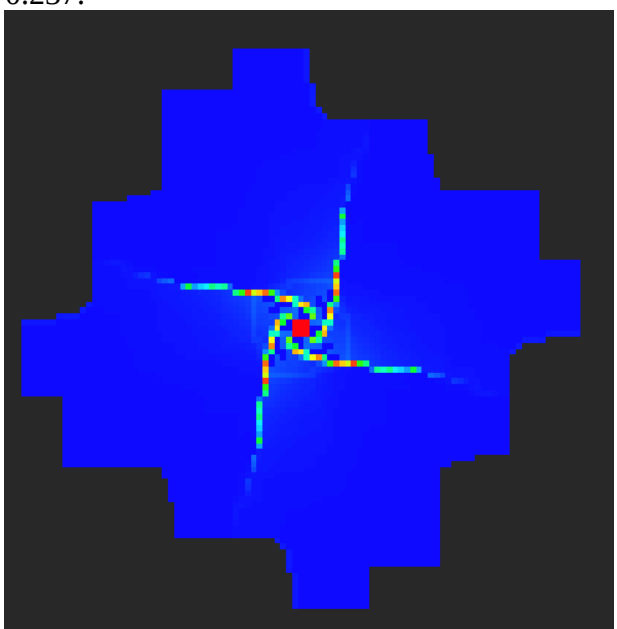


1398

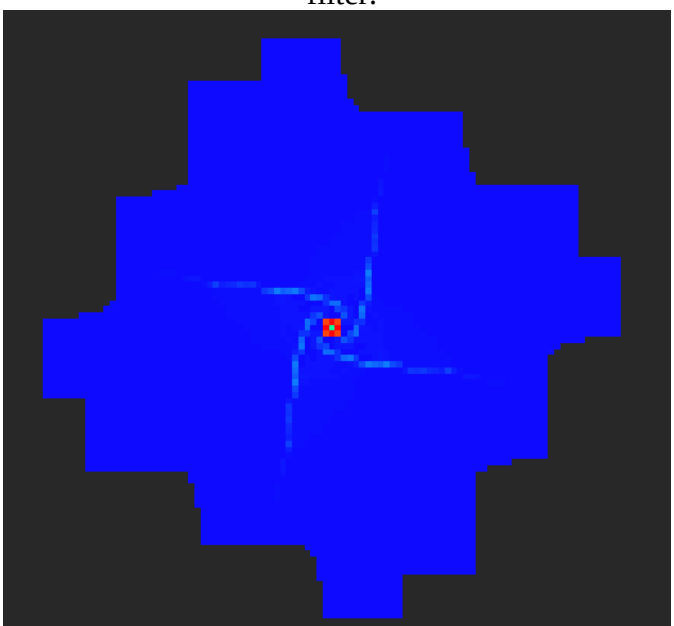


Annex 13. For this iteration any attempt to form other proto-particles ends in such an accretion disk. I seem to have seen images like this somewhere before ...

6|2|226 - filter 10000 - image scaling factor: 0.237.



Same image as the one on the left but without the filter.



Bibliography

Academician Caius, Iacob. 1980. *Theoretical mechanics.* Bucharest : Editura Didactică și Pedagogică, 1980. 1.

The book also includes information taken from the free encyclopedia ***Wikipedia*** *(https://www.wikipedia.org).*

Orthodox Bible – https://www.bibliaortodoxă.ro

Aristotle – Physics [Translated by R. P. Hardie and R. K. Gaye

Wolf, Christian; Lai, Samuel (21 December 2023). "The accretion of a solar mass per day by a 17-billion solar mass black hole" (PDF). *www.eso.org*. Retrieved 20 ebruary 2024.

Phil Plait (Jul 1, 2020),"IN THE DISTANT UNIVERSE A SUPERMASSIVE BLACK HOLE EATS A SUN *A DAY*",*Syfy Wire: Bad Astronomy*,Syfy

About the author

Valentin IONESCU was born on 2 June 1953.

As a teenager he wanted to become an astronomer; He polished telescope mirrors and asked his parents for a tutor with whom they could understand General Relativity faster.

He graduated from the Faculty of Mathematics in Bucharest.

He did not become an astronomer. He worked as a high school math teacher; he was for 10 years the sole shareholder and manager of an IT&C company. He is a research scientist in the field of programming. He worked almost all the time as a programmer.

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