Dedicated to our Lord and Savior Jesus Christ

The Spacetime

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Abstract

Ensuing from first principles, the theory of spacetime and its metaphysical axioms are introduced as prerequisites to physical theology and the so-called relative scale spacetime.

1. Introduction

After the announcement of Relative Scale (RS) spacetime in November 2015[1], many of my readers have been complaining that the theory is very difficult to understand. One of them boldly said, "you lost me on the second page". The fault is entirely mine, and in this paper[1] I will try to explain the prerequisites to the theory of RS spacetime and physical theology[2] (Sec. 6), hoping that if the reader is familiar with them, the first paper[1] will be easier to understand and study. I expect to improve this introductory paper, as the feedback from my readers can help me understand much better 'the Universe as ONE' and its unique spacetime, called 'the spacetime' (Fig. 7). Following Niels Bohr, I also wish to stress that every sentence of mine should be understood not as an affirmation but as a question.

In the Sec. 2, I will try to explain my personal, and perhaps biased, views on what is known as 'spacetime', and in Sec. 3 will explain the notion of 'the Universe as ONE' and its unique spacetime, focusing on its kinematics and dynamics. I will not repeat the proposals about the *origin* of gravity in RS spacetime, leading to quantum gravity of 'the Brain of the Universe'[1], but will only try to explain the basic basics.

This paper is dedicated to our Lord and Savior Jesus Christ. The reason I occasionally refer to The Gospel is that the Universe as ONE includes *absolutely* everything, and the latter matches the same *absolutely* everything denoted in theology with God, as revealed in The Gospel; hence the incomprehensible '*absolutely* everything' is their common denominator, *sit venia verbo*. In the framework of physical theology[2], science and theology are considered *complementary* presentations of '*absolutely* everything', as the latter leads in science to 'the Universe as ONE' and in theology to God in The Gospel, much like in Quantum Theory the incomprehensible 'quantum phenomenon' has two *complementary* presentations as 'quantum wave' and 'quantum particle'.

[1] The latest version of 'The Spacetime', with live links, can be downloaded from http://chakalov.net.

Thus, the incomprehensible '*absolutely* everything' looks in science as 'the Universe as ONE', and in theology as God revealed in The Gospel. The two understandings of what we call 'Nature' are *complementary* and equally important. It is my hope that 'the Universe as ONE', as seen in science[2], may be accessed with Mathematics[3], if the latter can overcome the limitations of human cognition in dealing with the **absolute** object, dubbed here 'the Universe as ONE' and known also as 'the set of all sets' (see Table 1 in RS spacetime[1]).

A gentle warning to the reader of these lines: one of the worst brainwashing religions is anti-theism. People who practice it consider themselves "scientists", but cannot even try to think about physical theology[2], because their brains are deadly blocked. It would be like accepting only 'quantum particles' and denouncing 'quantum waves'. If you, my reader, are obsessed by anti-theism but wish to understand the *origin* of geometry[7], look elsewhere.

2. What is 'spacetime'?

Fifty years ago, life was simple. I was teenager, and had clear understanding of what we call 'spacetime': an *aspect* of the physical world, such that we can imagine three perpendicular axes in space, and if we add a fourth dimension called time, we can model the trajectories of physical objects in 4D spacetime. For example, if we kick a ball, it will go up and then hit the ground, showing a parabolic trajectory (Fig. 1).

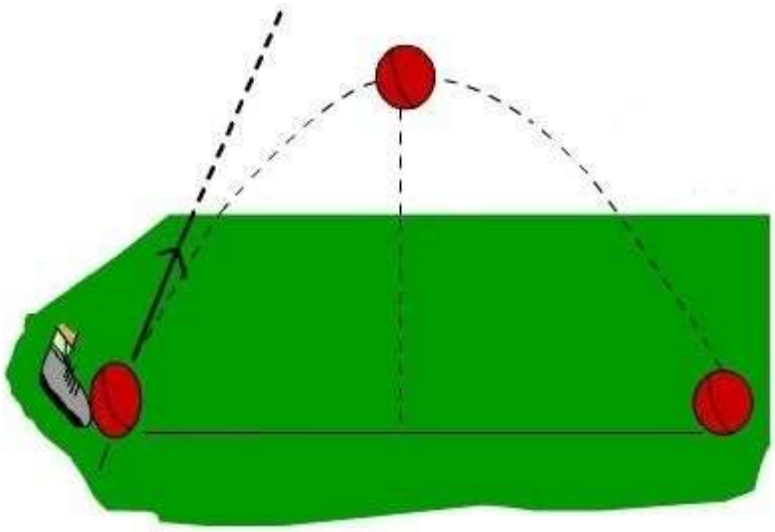

Fig. 1
Projective motion, adapted from Physics Tutorials

We can *imagine* two orthogonal spatial axes (not shown in Fig. 1), horizontal (x) and vertical (y), intersecting at a point in the center of the ball with coordinates x = y = 0. Once we kick the football, this imaginary point will produce a trajectory by changing its coordinates. Such imaginary orthogonal axes constitute 'spacetime': a *purely* geometric object (*Gedankending*) with dimension 4. Fifty years ago, I would "intuitively" reject the idea that a purely geometric object, obtained only with

imagination, could act back on the physical stuff that is producing it: the trajectory *itself* cannot act back on the football (Fig. 1).

Many years later, as I was studying General Relativity, I realized that such counter-intuitive phenomenon was indeed possible: Matter tells space how to curve, while space tells matter how to move (John A. Wheeler[4]). The situation is truly paradoxical, because the idea of 'spacetime as geometry' strongly resembles the grin of the Cheshire cat *without* the cat (Fig. 2), as explained by Alice[5].

Fig. 2

Fig. 3

The spacetime itself is *pure* geometry (Fig. 2) and cannot be directly observed. We *always* observe the grin on cat's face (Fig. 3). Yet, to paraphrase John Wheeler[4], in General Relativity the cat tells its grin how to "curve", while at the same time the grin tells its cat how to "move". Their mutual determination is inherently non-linear, as depicted in the famous 'drawing hands' by Maurits Escher (Fig. 4).

Fig. 4

At this point, at least two questions should be addressed. Q1: Which "hand" goes first? Matter (Fig. 3) of geometry (Fig. 2)? Q2: What kind of stuff could make up 'geometry'[7] in the first place? Namely, what is the *origin* of geometry?

In fact, Q1 is based on a wrong premise, because the spacetime of *physical* objects (Fig. 3) cannot be fixed "during" the non-linear negotiation (Fig. 4). Physically, such negotiation is *atemporal*. Only its *final* results are physical — those at which the negotiations are *already* completed, once-at-a-time, yielding a spacetime with **fixed** "arrangement of stress-energy" (Wikipedia), one-arrangement-at-a-time, as read with your clock. As to Q2, I suggest that the *origin* of geometry is a special pre-geometric plenum "which has no part" (Euclid), dubbed here 'the Universe as ONE', as seen from the perspective of science[2]. The idea is not original, because it is rooted on Plato's proposal (Fig. 5) formulated some twenty-five centuries ago.

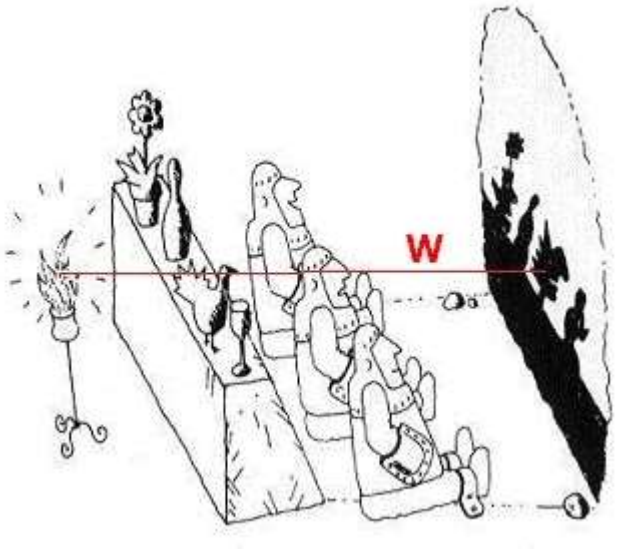

Fig. 5

The chained observers can see only a sequence of *already*-accomplished final results from the *atemporal* non-linear negotiations (Fig. 4) between matter (Fig. 3) and its geometry (Fig. 2), and such **assembled** snapshots of *physical* reality have particular property: 4D spacetime (Fig. 1). The chained observers cannot detect the *atemporal* Platonic source projecting *physicalized* 4D "shadows" (Fig. 5), which makes the spacetime of *physicalized* 4D "shadows" a *perfect* continuum: physically, there are no gaps between the successive 4D "shadows". If we picture the light source in Fig 5 as a movie projector and the world of *physicalized* 4D "shadows" as *assembled* 4D movie, we all are part and parcel of the movie, and cannot notice whether the movie operator (not shown) has decided to, say, take a coffee break and "temporarily" halt the movie. Physically, such "gap" in the underlying manifold of the physical 4D movie does not exist — it pertains to light-like intervals and every *physical* clock will read it as "zero".

Our *cognition* needs such "zero gap", so that we can *imagine* separated infinitesimal "pixels" here-and-now (Fig. 6), hence imagine the entire spacetime manifold *en bloc* (we cannot imagine "that which has no part", Euclid), only Nature is **not** built by imagination. We could also *imagine* that one can apply twice-contracted Bianchi identities to the entire spacetime and speculate how it could become gravitationally *closed* system endowed with *maximal* (Fig. 6) Cauchy surface (much like a football field (Fig. 1) but without *physical* boundaries), so that the total energy *might* be somehow "conserved"[6], but again Nature is **not** built by imagination (details in Sec. 3).

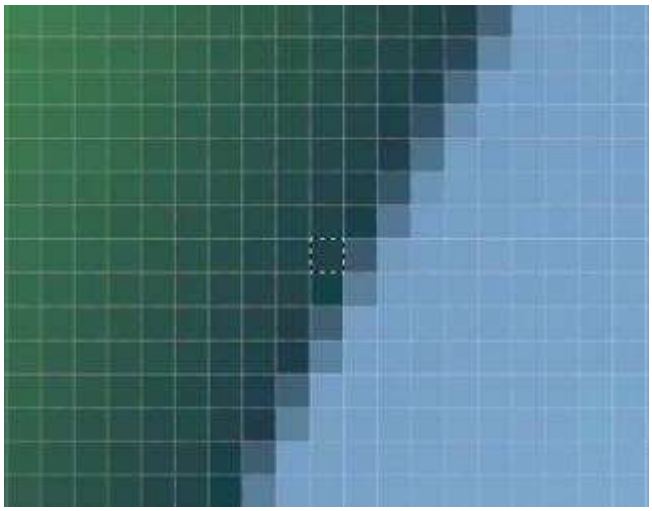

Fig. 6
Maximal Cauchy surface?

If we imagine Fig. 6 as a stone block, and a torch highlighting individual pixels one by one, the current GR textbooks[27,28] suggest that 'time as *change* of color' is an illusion, because there is no *global* time pertaining to the entire "block universe". Which is of course wrong, for obvious reasons[6].

To sum up (details in Sec. 7), the *atemporal* Universe as ONE, as exhibited in science[2], is residing "between" the "pixels" of spacetime continuum (Fig. 6), and cannot be *physically* detected due to the "speed" of light. From the perspective of science, **it** (not "He") is *absolutely* everywhere (Luke 17:21; 1 John 4:8). We can only hope that **it** could be revealed with Mathematics[3], *Deo volente* (Matthew 7:7).

3. What is 'the spacetime'?

To understand *the* spacetime of 'the Universe as ONE', we must include its atemporal source (John 1:1) as residing "between" the infinitesimal pixels here-and-now (Fig. 6) and "beyond" the physical spacetime. But where can we unravel such unphysical "zero gap" wrapping every spacetime "point" *and* the entire 4D spacetime *en bloc*? Let's take a closer look at the proposal by Plato (Fig. 5). The task is indeed ferociously difficult[7], chiefly because the omnipresent 'Universe as ONE' is *perfectly* protected from physical observations by the "speed" of light. If 'the ONE' was physically detectable, the theory of relativity will be demolished by such *physical* aether, and theology[2] could be reduced to science and cosmology. Thank God, this is impossible.

Before going to Plato's proposal, notice that we already have an alternative candidate for *both* "dark matter" (for example, the galaxy cluster IDCS 1426 is believed to contain roughly 90% non-baryonic "dark matter") *and* "dark energy": the atemporal 'Universe as ONE' does not emit nor reflect light. If it is also endowed with **self-action** (resembling the human brain), it will simply **act on itself** but will never *expose* itself, hence many academic scholars will consider it "dark", as if it comes literally from nowhere. They will be dumbfounded by "the worst theoretical prediction in the history of physics!"[8], ignoring the obvious explanation with Aristotle's Unmoved Mover: "that which moves without being moved", in clear violation of Newton's third law. This is exactly what the atemporal 'Universe as ONE' does, thanks to its **self-acting** faculty.

No *physical* agent in terms of "inflaton"[6] or any "fundamental scalar field" is needed, as we know since Plato — *Das noch Ältere ist immer das Neue* (Wolfgang Pauli).

Now we can model 'the Universe as ONE' as 'the Brain of the Universe'[1] endowed with *self-acting faculty*. I will introduce the notion of 'potential reality' as *not yet physicalized* state of 'the Brain of the Universe'[1]; the latter includes the human brain and all living organisms. Notice that 'potential reality' is neither 'matter' (*res extensa*) nor 'mind' (*res cogitans*), but a **third** kind of reality "just in the middle between possibility and reality", as stated by Heisenberg[9]. It is placed in the *potential future* of every event 'here-and now', shown with an infinitesimal pixel in Fig. 6. Physically, the *potential* reality does not *already* (Sic!) exist: the "zero gaps" between the pixels in Fig. 6 are not 'physical reality', thanks to which the spacetime manifold of 'the Brain of the Universe' becomes a *perfect* continuum called 'local mode of spacetime'. It is the 4D spacetime of *physicalized* Platonic "shadows", while the new axis **W** in Plato's allegory of the cave (Fig. 5) pertains to what I called 'global mode of spacetime' harboring the *potential* reality.

Hence *the* spacetime of 'the Universe as ONE' (the Brain of the Universe) is endowed with two modes, local and global, referring to *physical* reality and *potential* reality.

Again, if we try to present the *potential* reality as *physical* reality, the latter would seem to be coming from "nowhere" and many academic scholars will consider it "dark" (see above).

All this requires new metaphysics. I will introduce new structure and topology to what is known as 'spacetime event', by replacing it with the *interface* between *physical* reality placed in the irreversible **past**, and *potential* reality placed in the potential **future** (Fig. 7).

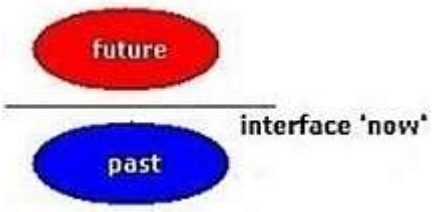

Fig. 7

Hence we have *quantum* potential reality in terms of 'the quantum state'[1], and *gravitational* potential reality in terms of gravitational "field". The latter will be explained in Sec. 4 with examples from the so-called gravitational wave astronomy[10]. Later I will demonstrate the application of *potential* reality to Mathematics (Sec. 5), arguing that many of the metaphysical postulates in current mathematical relativity are wrongly inferred from the seemingly "intuitive", but terribly misleading, presentation of infinitesimal "pixels" depicted in Fig. 6 — complex problems have simple[11], easy-to-understand[12], **wrong answers** (Fig. 8).

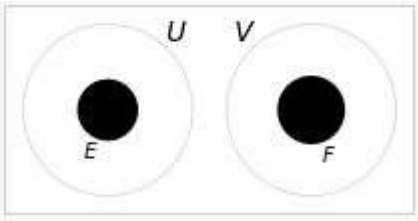

Fig. 8

Fig. 8 above, adapted from Wikipedia, shows the "intuitive" idea of 'normal space' (every paracompact Hausdorff space[11] is 'normal'), eloquently explained as follows: "The closed sets **E** and **F**, here represented by closed disks on opposite sides of the picture, are separated by their respective neighbourhoods U and V, here represented by larger, but **still disjoint**, open disks." Replace "the closed sets **E** and **F**" in Fig. 8 with any two neighboring pixels in Fig. 6, and you will obtain the same "intuitive" idea that is nothing but an *artifact* of human cognition and imagination: it is **wrong** to postulate "individualized" points **E** and **F** (Fig. 8), resembling Fig. 6, and "assume" that every point (Fig. 9) corresponds to a real number, and vice versa (Wikipedia).

Fig. 9

The real numbers correspond only to *res extensa* in the irreversible **past** (Fig. 7); we need hyperimaginary numbers[3]. But first, let's focus on 'geometry' (Fig. 2).

4. What is gravitational "field"?

For reasons which I was never able to understand, people strongly insist that the theory of gravity should be 'classical theory'. If true, we have only two alternatives: either the gravitational "field" is pure imagination (*Gedankending*) shown in Fig. 2, or a *physical* field, similar to electromagnetic field. Both alternatives lead to dead end[10].

Let me begin with a brief introduction. While we know that General Relativity (GR) can explain the perihelion of Mercury and fix the GPS Navigation System, we still don't know how the gravitational energy could "cover" a *finite* spacetime region *without* being localized at a spacetime point[13]. In other words, the *physical* energy coming from 'pure geometry' (Fig. 2) can indeed produce *work* on the football (Fig. 1) in order to *tweak* its trajectory, but cannot be localized at *any* point from the tweaked trajectory of the football. But there can be no such thing as "non-local energy". It can

only be *quasi-local*, as in the example with the *holomovement* of fish[14]: at every consecutive *interface* here-and now (Fig. 7), every local fish is negotiating (Fig. 4) its future **next** state with the *entire* school of fish[14]. Hence every fish negotiates (Fig. 4) its quasi-local trajectory with the rest of fish (Fig. 4), yet the (gravitational) energy of the *entire* school of fish remains delocalized to "cover" a *finite* "school of fish"[13]. Have our cake and eat it!

Notice also the *exchange* of energy-momentum and angular momentum between all fish bootstrapped in a school of fish[14]: it produces a *wave-like undulation*, just like in the locomotion of centipede's legs. What if both quantum and gravitational waves are produced by similar delocalized phenomenon? Regarding the quantum waves, perhaps we have to extend Henry Margenau's latency interpretation[15] by interpreting the *latent* observables as *quantum* potential reality[9] residing in the *potential* future of the *interface* here-and-now (Fig. 7), but in such way that only one *physicalized* "shadow" (Fig. 5) enters the irreversible **past** (Fig. 7) — one-at-a-time — to become 'physical reality', **after** the *atemporal* negotiations (Fig. 4) between the quantum potential states of all quantum "fish"[14] are being completed, once-at-a-time. Thus, the quantum waves are interpreted as resulting from the *holistic dynamics* of the school of quantum "fish", without the need for some *ad hoc* "fundamental scalar field", and we may entertain the possibility that "there is a subtle crosstalk between the atomic world and the Universe in the large, which may be on the verge of being detected."[16]

But the gravitational waves (GWs) are considered *physical* waves[10], and the experts in GR insist that their theory should be *classical* theory, as stress-energy tensors can only describe non-contextual *objective* (not potential[9]) reality, which has to be fully *independent* of the "gravitational school of fish".

Well, Albert Einstein was fully aware of the problems from tensors. As he succinctly put it at his last lecture (Room 307, Palmer Physical Laboratory, Princeton University, April 14, 1954): "The representation of matter by a tensor was only a fill-in to make it possible to do something temporarily, a wooden nose in a snowman."[17] Regarding the putative "gravitational school of fish", he was tacitly warning the experts in GR that his General Theory of Relativity is far from being complete[18]:

> The right side is a formal condensation of all things whose comprehension in the sense of a field-theory is still problematic. Not for a moment, of course, did I doubt that this formulation was merely a makeshift in order to give the general principle of relativity a preliminary closed expression. For it was essentially not anything more than a theory of the gravitational field, which was somewhat artificially isolated from a total field of as yet unknown structure.

To find out why GR *cannot* be 'classical theory', let me examine its two alternatives mentioned above: either the gravitational "field" is a *physical* field capable of

transporting energy, momentum, and angular momentum (Case 1), or it is pure imagination (*Gedankending*), as shown in Fig. 2 (Case 2), due to the absence of *gravitational* stress-energy tensor[19]. People even suggest that the gravitational field "does not exchange energy-momentum with both particles and electromagnetic field. So, it is not a force field, it does not carry energy-momentum" (Zhaoyan Wu, private communication). The proponents of Case 1, on the other hand, treat the gravitational "field" as a *physical* field, and dream of some "gravitational wave astronomy"[10]. But both Case 1 and Case 2 lead to dead end. Here's why.

Case 2 requires that GWs are fictitious objects[20] that cannot transport *any* physical stuff, so if GR were *bona fide* 'classical theory', we face an insoluble problem: GR explicitly forbids any referential background spacetime, known as "aether" (Sec. 3).

To explain Case 1, consider the following experiment, depicted in Fig. 10 below.

> Imagine an empty plastic bottle on your desk, trespassed by GWs from PSR J1603-7202[21], with dimensionless amplitude 2.3×10^{-26}, and explain the coupling of their wave strain to the plastic material of the bottle, leading to stresses[10]. How could gravitational waves produce **work** to induce stresses *and* squeeze the bottle ? Perhaps at 2.3×10^{-26} m ?

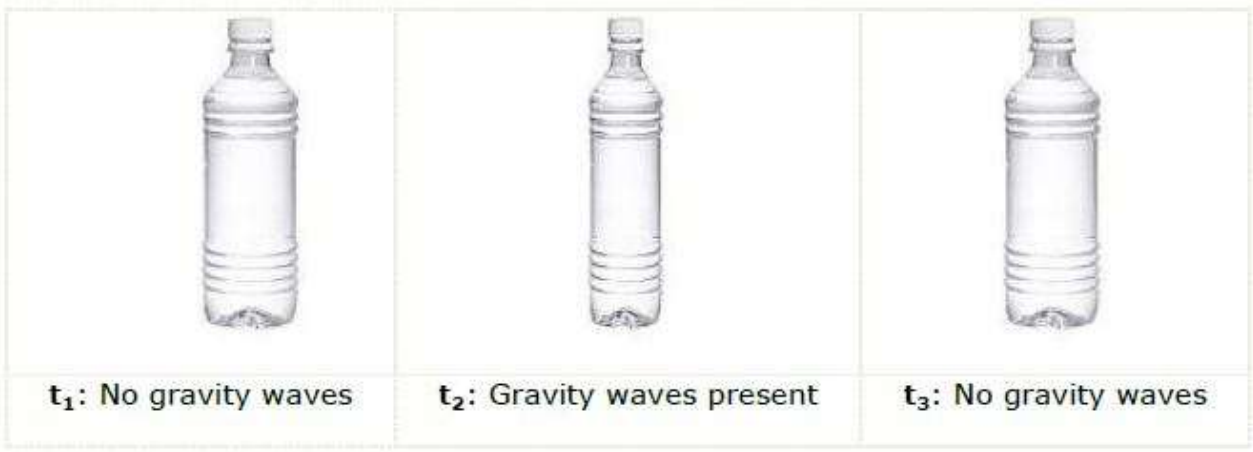

Fig. 10

Dead end, again. Therefore, the only remaining option is to seek a new theory of gravity by revealing Einstein's "total field of as yet unknown structure", metaphorically explained as "gravitational school of fish" above. Yes, "the gravitational field can do work on matter and vice versa" (Wikipedia), provided the gravitational "field" is *potential* reality[9,1] residing in the potential future of the *interface* here-and-now (Fig. 7). Thus, the potential reality is common to both quantum-gravitational and living systems, constituting the Brain of the Universe: see Table 1 in RS Spacetime[1].

5. Mathematical misconceptions

There are many mathematical misconceptions in GR textbooks[11], most of which do not even make sense, like a jabberwocky. Some of them originate from pure mathematics,

such as 'normal space' (Fig. 8), others from the "intuition" of physicists[22]. The first case are the misconceptions resulting from the "intuitive", and terribly misleading, *individuation* (Fig. 9) of 'points' (Fig. 8), and the second case are the misconceptions introduced by mathematical physicists 'by hand'[22]. I believe all misconceptions result from thinking only about 'physical reality' placed in the **past**, ignoring the 'potential reality' placed in the **future** (Fig. 7). Let me try to explain.

The *physical* reality, being *res extensa* (Fig. 3), conforms to Archimedes' Axiom[23] and is endowed with Archimedean topology, which can be explained as follows: if you have two timbers of different size, say, A = 3m and B = 10m, you can always find a positive integer $0 < k < \infty$, such that if you multiply the smaller A by k_l (l stands for 'large'), you will produce a timber *larger* than B, say, if $k_l = 4$, $4 \times 3 = 12 > 10$. But you can never reach some "infinitely large" timber and **stop** there. Ditto to the opposite case of "zero timber": if you multiply the larger B by k_s (s stands for 'small'), you can produce a timber *smaller* than A, say, if you choose $k_s = 4^{-1}$, the new timber will be 2.5m long ($1/4 \times 10 = 2.5$). But again, you can never reach some "infinitely small" timber and **stop** there. In this sense, the Archimedean topology is equivalent to *potential* infinity[1] with which one cannot *actually* reach 'infinity': the *physical* reality does not include "infinitely large" nor "infinitely small", and never **stops**. Stated differently, the *physical* reality is cast on *perfectly smooth* trajectories, and can never 'run out of points' (the so-called "geodesic incompleteness" is a myth).

On the other hand, the (ε, δ)-definition of limit uses actual/completed infinity. An explanation from a bartender runs as follows (Fig. 11):

> An infinite crowd of mathematicians enters a bar. The first one orders a pint, the second one a half pint, the third one a quarter pint... "I understand", says the bartender - and pours two pints.

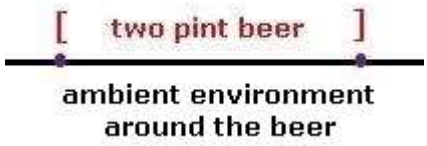

Fig. 11

Look at the two **red** endpoints in Fig. 11: do they belong to the largest beer *or* to the ambient environment around the beer? **Wrong question**. It cannot have an answer, because it is manifestly **wrong** to even think about 'points' as *individuated* objects (Fig. 9 and Fig. 8) and then "associate" real numbers with them: real numbers pertain only to 'physical reality' in the **past**, while "that which has no part" (Euclid) belongs to the potential **future** (Fig. 7). Hence we may need hyperimaginary numbers[3] to accommodate the two forms of reality, physical and potential. Surely we **always** have *physicalized* "shadows" (Fig. 5) placed in the irreversible **past** (Fig. 7) at which the potential **future** is already absent, non-existing, just "zero", which is why we cannot "look" at it, as Plato suggested many centuries ago. But without it, we cannot explain the *quantum* potential reality[9] and the *gravitational* potential reality[13] (Sec. 4). They do not have 'parts' and build up 'the Universe as ONE', as exhibited in science[2].

6. Physical theology

To elaborate on what was said in Sec. 1, let me stress that physical theology is *not* religion and can never become one. It does not offer statements that people must either accept with belief or reject with belief, but an *interpretation* of Nature based on the doctrine of *trialism*: ONE entity explicated by its two complementary, and ontologically different, presentations (e.g., science and theology[2]) needed to understand the ONE. Or rather to get a bit *closer* to understanding the ONE. Stated differently, physical theology does not offer rewards nor makes any promises, but only offers an *interpretation* of Nature, which can be beneficial to people. Let me explain.

Imagine an Eskimo, who has never seen and will never see an elephant in his life, yet can make observations on elephant's trunk by two complementary devices, which can measure either properties of 'arm' or properties of 'nose'. The Eskimo can never understand the underlying ONE entity called 'trunk', because he cannot, not even in principle, find any similarities shared by the two *complementary* explications of 'trunk', 'arm' and 'nose' — they are *totally* different, like quantum particle and quantum wave, or like science and theology. Yet they are both needed[2] to get a bit "closer" to understanding their dual, and totally incomprehensible, non-relational source dubbed 'the ONE'.

We strive to understand Nature juts like Eskimos, and should be aware that, in the framework of theology, God is first and foremost 'love': Whoever does not love does not know God, because God is love (1 John 4:8). In the framework of science, it (not "He") is placed at 'absolute infinity' (Georg Cantor), exactly "between" the **past** and the **future** (Fig. 7). Hence if we want to understand the physical world and improve our physical life, we should do it by keeping a parallel connection to 'God as Love'. It's a package. But in physical theology, our understanding of Jesus is far simpler than what one can hear from a Catholic priest, say.

We all are children of God, Jesus Christ included, only he was far "closer" to God. Hence Jesus could very well fall in love, as there could be no "ban" on falling in love, because love is from God (1 John 4:8). Back in the old days, Jesus had to use simple metaphors and parables to deliver the message about God, in such way that even fishermen with no education can understand it. These were his limitations: the audience knew nothing about quantum gravity and foundations of Mathematics[3]. Nowadays we can start from physical theology[2] — it is far more straightforward, to say the least. Despite the fact that physical theology employs only a tiny fraction from The Gospel, the end result is effectively the same, in my opinion.

This is the reason to dedicate this paper to our Lord and Savior Jesus Christ.

7. Summary

Let me repeat the main ideas. Ensuing from Plato's proposal (Fig. 5), I suggest that *the* spacetime of 'the Universe as ONE' has two *modes*, called local (physical) and global, pertaining to physical reality and potential reality. The Universe as ONE is assumed to possess *self-acting* faculty exhibited in consecutive **re**-creation of its spacetime (dubbed 'Arrow of Space'[1]), leading to *assembled* 4D world of *physicalized* Platonic "shadows" placed in the irreversible **past** of the interface 'here and now' (Fig. 7). To explain an instantaneous "snapshot" from the hypothetical Arrow of Space, I will ask the reader to imagine a transcendent (or transient) tachyon[24], which is *omnipresent*, in the sense that it trespasses the entire local (physical) mode of spacetime for "zero" time, as read with a physical clock. Relative to the *local* mode of spacetime, the transcendent tachyon will have "infinite" speed and will be *simultaneously* "located" absolutely everywhere (Luke 17:21 and at 'absolute infinity' (Georg Cantor), depicted with the horizontal line in (Fig. 7). The *assembling* of spacetime proceeds along the atemporal axis **W** (Fig. 5): a null surface "located" on the light cone, inhabited by the transcendent tachyon as well. The **re**-creation and **re**-foliation[25] of *the* spacetime — once-at-a-time, as read with a physical clock — "takes place" at null surfaces, along the atemporal axis **W** (Fig. 5), which is why there is no *metric* there. The latter *emerges* only within the *assembled* null surfaces, resulting in **four** topological dimensions of the *local* mode of spacetime (4D spacetime), like "pages of a book"[25].

NB: Notice that we introduce geodesic-generated **null-surface** (not hypersurface[26]) and *physically* unobservable time[30] "along" null vector "orthogonal to *itself!*"[31]

In brief, the topology of spacetime obtains new *dynamics* (dubbed 'biocausality'[29]), exhibited in the Arrow of Space. The latter is being *completely* **re**-nullified in the irreversible **past** and **re**-born in the **next** potential future, at each and every *interface* here-and-now (Fig. 7). It is like climbing on a ladder, in the sense that at every *completed* step shifted in the **past**, there also is a new *potential* future ahead, which will be negotiated with the entire 'school of fish' (Sec. 4) for the **next** *infinitesimal* step of the ladder, generating a finite interval in Minkowski spacetime. Thanks to Plato's proposal (Fig. 5), the negotiation (Sec. 4) is *atemporal*, and the **re**-created local (physical) mode of spacetime is *perfect* continuum[32].

Again, one can postulate Lorentzian metric[26] and relativistic causality[22] only within the assembled 4D spacetime. In my opinion, this is the only way to present geometry as *emerging* from 'something else'[7] (details on the alternative proposals by Penrose & Norris are available upon request), because the alleged "local differential geometry"[27] is false — complex problems have simple[11], easy-to-understand[12], **wrong answers**.

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