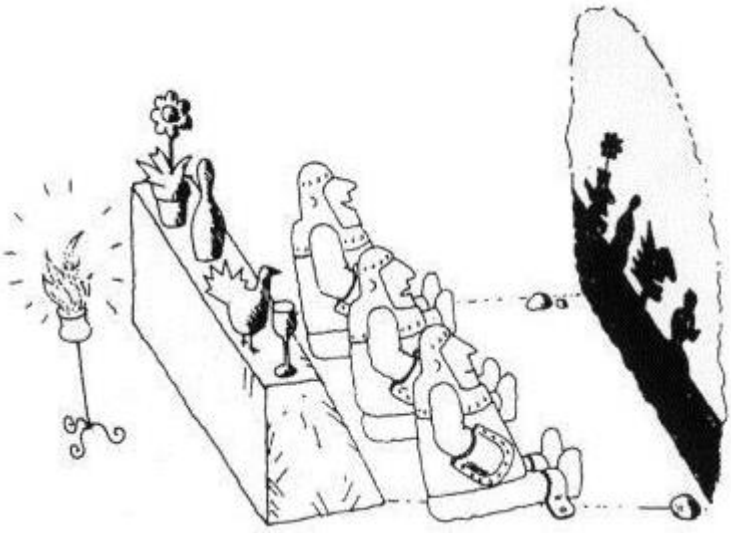

Lecture Notes in Platonic Theory of Spacetime

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Commemorating 110 years of Hermann Minkowski's lecture RAUM UND ZEIT, given at the 80th Meeting of the Natural Scientists in Cologne on 21 September 1908 and based on the crucial contributions to the theory of Special Relativity by Hendrik Lorentz, Albert Einstein and Henri Poincaré[2], I offer my video lecture, entitled 'Platonic Theory of Spacetime'. It will be posted at my YouTube channel on Friday, 21 September 2018, at 10 AM GMT. Here are the current Lecture Notes (draft version) to the video lecture, which will be replaced with their final version by the end of September 2018. The video lecture on 21 September 2018 (see p. 10 below) is organized in three sections: (**i**) what is the Platonic theory of spacetime, (**ii**) where it comes from, and (**iii**) what follows from it. I hope that the video lecture, backed with the final Lecture Notes with references, will be easier to understand.

Ensuing from Plato's Cave and the ideas by Heraclitus and Aristotle, I present the Platonic theory of spacetime: the atom of geometry (dubbed "point") is treated as complex object endowed with specific structure, topology, and dynamics. It is suggested that what we call 'spacetime' is not some inert geometric object, but a holistic bootstrapping phenomenon, which holds the entire physical world together, as the latter evolves along the Heraclitean flow of events (called here Arrow of Space). Hence 'space' and 'time' are interpreted as *emergent* phenomena pertaining solely to the 'wall' in Plato's cave, whereas their **nonphysical** Platonic source, dubbed 'potential reality' or *Res potentia*, does **not** live anywhere on Plato's 'wall' (called 'local mode of spacetime', pp. **8-9** in FRAUD.pdf) and remains *perfectly* hidden by the "speed" of light (**A2** in Slide **19** in Quantum Spacetime).

What physicists nowadays call 'spacetime' is treated as *local mode* of spacetime relevant only to the *physicalized* explications of the Universe — nothing but 4D "shadows" of *Res potentia*, as Plato suggested many centuries ago. Thus, a new quantum-gravitational

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[1]Email: dchakalov@gmail.com. Download the final version of about_spacetime.pdf on 30.09.2018 from this http URL.
[2]H. Poincaré, Sur la dynamique de l'électron, *Comptes Rendus Acad. Sci* Paris, 140, 1504-1508 (5 Juin 1905).

spacetime, equipped with local and global modes, is proposed for quantum gravity and cosmology: every *physicalized* system is endowed with both 4D local mode of spacetime determined by the local properties of matter and fields, and global mode of spacetime determined by the global properties the entire Universe as ONE. It's a bundle.

First, some history. On June 2, 2008, commemorating the one-hundredth anniversary of Hermann Minkowski's lecture 'Space and Time' on 21 September 1908, I invited many theoretical physicists and mathematicians to attend my talk in Munich on 21 September 2008: read my invitation at this http URL. Now I offer a video lecture, which will be available on 21 September 2018 (p. 10 below). Feel free to subscribe by email with subject "Platonic Theory of Spacetime, 21 September 2018". You will receive password to watch the lecture (app. 20 min) and will be able to download it until 10 AM GMT on 30 September 2018. The main idea was explained at my first talk on 21 September 2008[3]: every *finite* (bounded) spacetime region has both *local* properties (local mode of spacetime) and *global* properties (global mode of spacetime); the latter are determined by the properties the entire Universe as ONE, most notably by the **self-acting** faculty of Aristotle's Unmoved Mover. Thus, we arrive at the proposal by Heraclitus 'you cannot look twice at the same river', and suggest that the irreversible *flow* of 4D events 'here and now', constituting the local mode of spacetime, cannot be observed in principle due to the "speed" of light. We only have *physicalized* remnants from the **self-action** of the Universe as ONE, which many (otherwise smart) people consider "dark". Surely *Res potentia* does not emit nor reflect light, simply because it does **not** live anywhere on the light cone. It is "before" light.

To give you a glimpse at the forthcoming video lecture, check out (**i**) Slide **7** and **A2** in Slide **19** in Quantum Spacetime, (**ii**) my comments on the alleged temporal and spatial orientability of spacetime at this http URL, and (**iii**) pp. **21-26** in Hyperimaginary Numbers. Instead of mimicking Nature by postulating the orientability of spacetime 'by hand', we should get professional and uncover the proper mathematical formalism and tools.

To understand 'space' and 'time', let me stress that their *origin* poses an outstanding challenge. Consider, for example, Sergio Ulhoa *et al.*[4] (I will talk on the Hubble Law later):

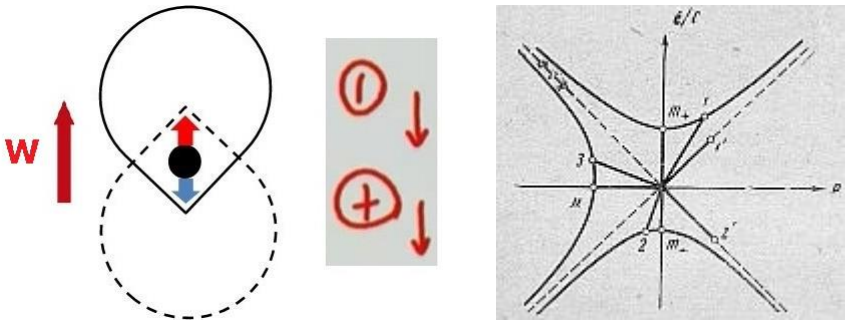
> The modern observational cosmology inaugurated at the Mount Wilson Observatory gave a great impetus to understanding the Universe [1]. The Standard Cosmological Model, alongside the Cosmological Principle and field equations of GR, describes all knowledge about large structures with good approximation. The Hubble Law shows how fast galaxies move away from each other at a relatively small distances. Thus it could be used to test new cosmological theories. The Cosmological Principle states that the Universe is isotropic (above 100 Mpc) and homogeneous (there is no center) in addition its dynamics is given by the Einstein field equations, $R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R = 8\pi T_{\mu\nu}$. In such a way it is possible to trace a complete time evolution of the Universe. If the time is set backwards (Sic! – D.C.) we see that everything started in a warm and dense state with domination of the radiation energy. The metric that admits the Cosmological Principle and the dynamics given by the GR is that of Friedman-Lemaître-Robertson-Walker (FLRW) [2-6]:
>
> $$ds^2 = -dt^2 + a^2(t)\left[\frac{dr^2}{1-\kappa r^2} + r^2 d\Omega^2\right], \qquad d\Omega^2 \equiv d\theta + \sin^2\theta\, d\phi^2 \tag{1}$$
>
> where k assumes values of −1 (negative or closed spatial curvature), 0 (null or flat spatial curvature) or +1 (positive or open spatial curvature).

[3]You may wonder, why am I doing these efforts to promote again the Platonic theory of spacetime? Because spacetime engineering is the future. If people again ignore my work, as they did ten years ago — so be it. Matthew 7:6.

[4]Sergio Ulhoa *et al.*, arXiv:1802.08087v1 [gr-qc], 21 February 2018.

Here's the problem: once we introduce *metric* of spacetime, as Hermann Minkowski did at his famous talk on 21 September 1908, we face the ***origin*** of spacetime, which must have existed "before" the instant of creating spacetime endowed with metric. This **metric paradox** prompted Yakov Zel'dovich to suggest that "long time ago, there was a brief period of time during which there was still no time at all." (Private communication; translation mine – D.C.) Needless to say, he was joking. Point is, the metric paradox remained unsolved until the author of these lines found its unique, and highly non-trivial, solution dubbed Finite Infinity (**FI**)[5]. Do you remember the ancient Dragon chasing its tail? You need two *dual* states of the Dragon: one in which it has already caught its tail, and another one in which it is only approaching its tail, but can never actually catch it. The first state of the Dragon is called actual or completed infinity, while the second one is known as potential infinity. Blend the two states and you will obtain **FI**, plus the so-called *dual age* of the Universe (p. **4** in Hyperimaginary Numbers). But let's go back to the basics.

Let me again suggest, following my previous talk on 21 September 2008, two *modes* of the Universe viz. its spacetime: local mode (determined by actual or completed infinity) and global mode (determined by potential infinity). It's a bundle: see Fig. **3** in Gravity-Matter Duality. We can explain the local mode only by referring to properties of the global mode, and *vice versa*. I will elaborate later on the hypothetical *polarization* of primordial mathematical points (read my comments at this http URL); for now let me stress that the two *modes* of spacetime exist due to the Heraclitean *flow* of 4D events 'you cannot look twice at the same river'. Prior to the *polarization* of primordial points, the proto-Universe could have existed only as 'non-reality' or [John 1:1] which, *after* the Beginning, is located "inside" each and every fleeting 4D shadow 'here and now' (Luke 17:21).



The **self-action** of the Universe. Check out Fig. **5** in Gravity-Matter Duality, Refs **10** and **15** in Hyperimaginary Numbers, and Sec. **3** in *Panta Rei*: The Evolution Equation.

The two modes of spacetime can be visualized with spacetime "lattice" in which every two consecutive points, **A** and **B**, are timelike separated ($\mathbf{s^2 > 0}$), only now you have to *totally* remove **all** gaps and make the spacetime manifold *perfect* continuum: see Fig. **1** in *Panta Rei*: The Evolution Equation, p. **4**. In the *local* mode, the gaps are **non-existent** due to the "speed" of light (**A2** in Slide **19** in Quantum Spacetime), while in the *global* mode the same gaps are "elevated" along the **atemporal** *hyperimaginary* axis **W** (the radius of expanding balloon, Fig. **4** in Gravity-Matter Duality) harboring the Platonic *Res potentia*. Notice that the 4D "shadows" on Plato's wall (local mode of spacetime) are patches from the inflating balloon in Fig. **4** in Gravity-Matter Duality, p. **5**.

In a nutshell, every **next** event 'here and now' along the Heraclitean *flow* of events is **jointly** (Sic!) determined by its irreversible history and potential future. This new form of

[5]D. Chakalov, viXra:1410.0194vD, 2015-11-08, p. 7; viXra:1705.0219v8, 2017-06-21, p. 6.

retarded causality (there are no tachyons — the cause and its effect are *always* timelike separated) was called 'biocausality' in January 1990, but it took over **23** years to model gravity and suggest the theory of quantum gravity on 20 October 2013.

Here I won't have time to explain the Heraclitean *flow* of events hidden by the "speed" of light (**A2** in Slide **19** in Quantum Spacetime), which produces two modes of spacetime. Let me briefly mention that the infinitesimal step "forward" along the *flow* of events (dubbed 'Arrow of Space') is *complemented* by infinitesimal step of "rotation"[6]. It's a bundle.

Check out the drawing above and study the references. As I mentioned previously, we have in the local mode of spacetime only ***physicalized*** remnants from the **self-action** (depicted above) of the Universe as **ONE** in the global mode, which some people consider "dark".

But what is *local* mode of spacetime? It pertains to the *physicalized* 4D world of "shadows" (see above). It is always "squared" (Wikipedia) and is placed exclusively in the *irreversible* past of every instant 'here and now' (Sec. **4** in Gravity-Matter Duality) from the light cone. The *global* mode of spacetime, on the other hand, does not live anywhere on the light cone (pp. **8-9** in FRAUD.pdf). It inhabits the *potential* future (*Res potentia*) of the same instant 'here and now'. The latter is supposedly endowed with structure, dynamics and topology: the transition from potential future to irreversible past (recall the Dragon chasing its tail, p. **3** in Penrose-Norris Diagram) is neither along an open (straight) causal line nor along a closed causal circle, but "along" topological *superposition* of the two (Fig. **1** in CEN.pdf). An apple can fall from a tree only if they both 'rotate'. It's a **bundle**, again.

Regarding Quantum Theory, the reason for introducing *global* mode of spacetime was explained in Quantum Spacetime (e.g., Slide **7**). In one sentence: the genuine quantum state[7] of every quantum system is an **intact** *Res potentia*, which is neither "particle" nor "wave", does not "collapse" nor "decohere", and is not "uncertain" but *flexible*: God casts the die, not the dice (Albert Einstein). As to General Relativity (GR), we need the *global* mode of spacetime to understand the origin of inertia[8] and the *physicalization* of gravity in (the *local* mode of) spacetime. In current GR textbooks, it just doesn't work (MTW p. 467) — check out the gravitational "pizza" in Gravity-Matter Duality.

In short, I suggest quantum-gravitational spacetime endowed with local and global modes, which could allow us to model the entire Universe as human brain. Now let me more specific on the two modes of spacetime and their origin [John 1:1].

We assume that 'spacetime' is represented by geometry, but what is 'geometry' made of? What is the ***atom*** of geometry? We know 'matter' from classical physics, say, tables and chairs or physical fields (e.g., electromagnetic field). Given the indisputable practical success of Quantum Mechanics (QM), we are sufficiently confident that what we call 'matter' is ultimately rooted on energy, at least to the extent to which mass and energy are "equivalent" (there is a big can of worms in this issue, which I am not going to open right now). However, we cannot reproduce 'matter' solely from 'energy', because an *absolutely essential* ingredient of the physical world is missing in today's QM textbooks: the **matrix**. Let me quote from the seminal speech by Max Planck *Das Wesen der Materie* (The Nature of Matter) at Florence in 1944:

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[6] D. Chakalov, viXra:1705.0147v3, Sec. 3.

[7] P. Ghose, arXiv:0906.0898v1 [quant-ph], 4 June 2009; M.S. Leifer, arXiv:1409.1570v2 [quant-ph], 6 November 2014.

[8] Ignazio Ciufolini and John A. Wheeler, *Gravitation and Inertia*, Princeton University Press, 1995, pp. 4-5 and p. 270.

> There is no matter as such! All matter originates and exists only by virtue of a force which brings the particles of an atom to vibration and holds this most minute solar system of the atom together. We must assume behind this force the existence of a conscious and intelligent Geist (bewußten intelligenten Geist). This Geist is the matrix of all matter.

But the **matrix** is not 'mind' (bewußten intelligenten Geist): the **matrix** is not *Res cogitans*, but Platonic *Res potentia* or 'potential reality'. Surely one cannot somehow "attach" mind and consciousness to quantum particles and the vacuum; check out a simple explanation on p. **3** in Hyperimaginary Numbers.

You may ask, if the **matrix** is not physical stuff (*Res extensa*), how is the physical world related to it? By its spacetime **topology**: the **matrix** operates exclusively in the global mode of spacetime, whereas its creative effects (Slides **9**-**12** in Quantum Spacetime) are being *physicalized* (Sic!) in the local mode of spacetime (Table **1** in The Spacetime, p. **14**).

To help you understand the **matrix**, replace it with 'money' and imagine a 4D physical universe made only by physical money: you can never see 'money *per se*' (global mode of spacetime), but only particular *physical* manifestation of 'money' (local mode). You cannot ask profound questions like 'what are money made of?', just as you cannot ask 'what is matter made of?'. Everything in the physical universe, including gold, silver, and crypto currencies, are *physical* manifestations of 'money'. If you prefer, you may replace the English label 'money' with different labels from other languages, say, *argent* (French), *Geld* (German), *pengar* (Swedish), 钱 (Mandarin), etc., yet you can never alter the *meaning* of 'money', nor observe its Platonic **matrix** 'money *per se*' kept in the global mode of spacetime. Why not? Because you can see only various *physicalized* 4D "shadows" from the **matrix** (see below) — you cannot "turn around" and look straight at their common **matrix**, as Plato explained many centuries ago. I wish to ameliorate Plato's proposal by suggesting that the Platonic **matrix** is both 'one' and 'many' (non-denumerable *Res potentia*), which cannot have any **metric** (Yakov Zel'dovich), just as there is no *physical* distance between the *idea* of a tree and the *idea* of a mountain. Also, if the qualia from electromagnetic radiation with wavelength 620-750 nm is what we call (in English) 'red', keep in mind that there is no qualia from the Platonic **matrix**, because the latter is inherently **UNspeakable**: check out a simple experiment with your brain on p. **2** in Hyperimaginary Numbers. Thus, in cognitive psychology the **matrix** corresponds to 'cognitive vacuum', whereas in physics *the same* (Sic!) **matrix** corresponds to quantum vacuum[9]. If we learn how to access the **dual matrix** (cf. the doctrine of *trialism*, Slide **14** in Quantum Spacetime), perhaps we will be able to practice spacetime engineering. Again, the matrix ***itself*** is not directly observable, yet it is not "dark", as some (otherwise smart) people chose to call it. It is neither physical stuff (*Res extensa*) nor mental stuff (*Res cogitans*). It is 'potential reality' (*Res potentia*), "just in the middle between possibility and reality" (Werner Heisenberg[10]).

Can we uncover *Res potentia* in Mathematics? Yes we can. It has been residing, right after the Beginning [John 1:1], in the **atom** of geometry, dubbed "point" — "that which has no part" (Euclid). Let me explain the **atom** of geometry (p. **17**) by referring to the topological property of the spacetime *manifold*, called Finite Infinity (**FI**).

Look at $\mathbf{R}_{\infty} = \emptyset$ in Fig. **7**, p. **9** in Hyperimaginary Numbers, and notice that 'the Ghosts of departed Quantities' (George Berkeley) has **absolutely** (Sic!) disappeared *exactly* at the

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[9] Peter W. Milonni, *The Quantum Vacuum*, Academic Press, 1993, Ch. 2.6.

[10] Werner Heisenberg (winter 1955-1956), *Physics and Philosophy*, Prometheus Books, 1999, p. 43 and pp. 155-156.

limit we know from Augustin-Louis Cauchy: *Res potentia* does not belong to the "points" from the real number line; it has only *physicalized* **footprints** there (p. **8** in FRAUD.pdf). We can include **absolutely** all points (**footprints**) from the spacetime manifold with **FI** (read above), by *both* actual infinity (Fig. **11** in The Spacetime, p. **12**) *and* potential infinity ("as closely as desired", Adolf Fraenkel): check out p. **6** in Penrose-Norris Diagram.

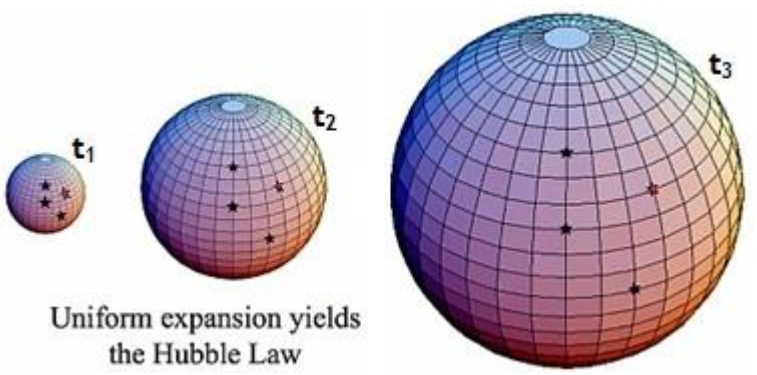
Everything said so far is intended only to explain the Platonic theory of spacetime, based on the two *modes* of spacetime above. Now I will argue that we ultimately need it.

The conceptual solutions to (**i**) the measurement problem in QM and (**ii**) the "dark energy", with the **self-action** (see the drawing above) of the entire Universe as **ONE**, are unique — there is no other solution to the unification of QM and GR. The latter theories turned out to be essentially incomplete, as their textbook versions lack the crucial notion of quantum-gravitational reality, presented with two *modes* of spacetime: read Gravity-Matter Duality.

Now I will argue about the need for Platonic theory of spacetime to understand the mundane notions of 'space' and 'time'. For example, suppose you look at the night sky and see an unbounded black space sprinkled with bright stars, while your clock reads every consecutive moment from your observation of this endless, seemingly infinite, 3D space. Simple, isn't it?

Not at all. Thanks to Edwin Hubble, we know that this enormous spatial container, dubbed 'space', is "expanding" ***within itself*** (Fig. **4** in Gravity-Matter Duality), and the *dynamics* of this totally incomprehensible "expansion" determines the dimensionless scaled factor, presented with what we call 'time', as read with a physical clock. Nothing is simple here, as the alleged "expansion" of space must be *non-referential*, that is, 'absolute'[11], and the engine of this "expansion" is related to the energy density of the vacuum, which leads to "the worst theoretical prediction in the history of physics!"[12]

The great Edwin Hubble never accepted the interpretation of his groundbreaking discovery as "expansion" of space. Georges Lemaître did, and now physicists and cosmologists have to use, *faute de mieux*, the FLRW model mentioned above, and quietly ignore the metric paradox exampled by Yakov Zel'dolich, about the **center** of the "expanding balloon":



See Fig. **4** in Gravity-Matter Duality

All physical systems live on the 3D hypersurface of the cosmic "balloon" above, as 4D "shadows" depicted below. Thanks to the "speed" of light (**A2** in Slide **19** in Quantum

[11]Michal Chodorowski, arXiv:astro-ph/0610590v3, 27 March 2007, p. 1.
[12]M. P. Hobson, G. P. Efstathiou, A. N. Lasenby, *General Relativity: An Introduction for Physicists*, Cambridge University Press, 2006, p. 187.

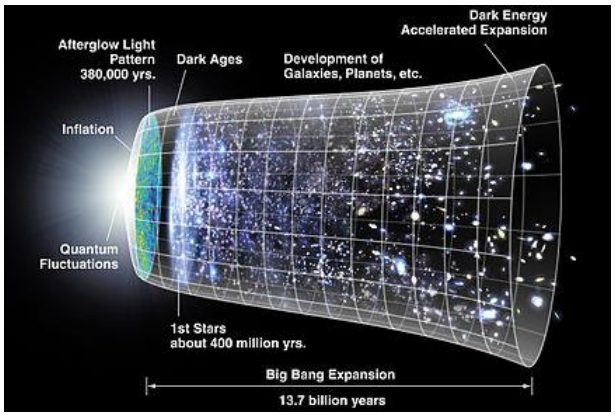
Spacetime), we have no ***physical*** access to its (hyperimaginary) radius denoted with **W** in Fig. **5**, p. **6** in Gravity-Matter Duality, which matches the "direction" of the Heraclitean *flow* of events dubbed 'Arrow of Space'. The latter is omnidirectional and *atemporal*, and its "vector" is *totally* eliminated in the **squared** (Sic!) spacetime interval (Wikipedia). Thus, the Heraclitean 'arrow of events' (read my comments on the current temporal and spatial orientability of spacetime at this http URL) is **non**-relational and **absolute**, or else it will be *physical* phenomenon and the theory of relativity will be **demolished**. This very simple argument poses great problems to many people, perhaps because they are haunted by Marxist-Leninist philosophy and deeply believe that we were made exclusively by atoms (ref. [**18**] in Hyperimaginary Numbers, p. **15**).

The Platonic theory of spacetime solves all these problems *en bloc*. For if we use Finite Infinity (read the explanation above), we have *dual age* of the Universe: finite in the local mode of spacetime, and "infinite" or rather **un**decidable in the global mode. Once created by God [John 1:1], the Dragon can never reach any 'limit' and (inevitably) **stop** there.

Let me go back to the **self-acting** faculty (see above) of the entire Universe as ONE. In the physical world modeled with local mode of spacetime, there is only physical stuff. The Platonic *Res potentia* (global mode of spacetime) does not interact with matter. Instead, matter interacts with **itself** by self-action: **only matter can act on matter**. In the world of *living* matter, such as the human brain and every living organism, their self-organization and self-action is known as 'activity', after Nicolas Bernstein[13].

As an example, consider the human brain: there is no "dark" computer in your brain, which could conduct and correlate billions of neurons and trillions of synapses, not to mention your embryonic state. What could possibly achieve such astonishing result? The biological **matrix**[14]. Now switch to the entire Universe modeled as 'brain' and check out the quantum **matrix** above. If you don't like parapsychology and "anthropic principles", you need the Platonic theory of spacetime and the doctrine of *trialism* (Slide **14** in Quantum Spacetime).

Since I have to squeeze my lecture into 20 min, I cannot address here the *rate* of time. Check out [**6**] above, regarding the so-called 'relative scale spacetime' or **RS** spacetime. It's all relative. Keep also in mind that the popular drawing from Wikipedia below, showing the alleged topology of "expanding" spacetime, is *terribly* misleading, to say the least.



There are no *absolute* inertial observers in GR, who could "see" the Universe *en bloc*: recall the metric paradox above and the bold fact that the "expansion" of spacetime is,

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[13]N.A. Bernstein, *Essays on the Physiology of Movements and Physiology of Activity*, Moscow, 1966 (in Russian).

[14]At the time you were 12- to 14-week-old embryo, your nerve cells were created at the rate of about 15 million per hour, and later your brain established 1,000 trillion synaptic connections, so that now you can read and think.

and has *always* been, faster-than-light[15]. The entire Universe as **ONE** can exist only in its global mode, as Platonic *Res potentia* grounded on God (John 1:1; 1 John 4:8). It (not "He") **re-creates** the local (physical) mode of spacetime at every 4D instant 'here and now' along the **radius** of the "expanding balloon" above (dubbed 'Arrow of Space'), as both change **of** spacetime (global mode of spacetime) and change ***in*** spacetime (the co-ordinate time in the local mode of spacetime). It's a bundle, again. But you will need Finite Infinity (**FI**) above to understand the new "limits" of spacetime *manifold* (Sic!) toward the two opposite "endpoints", the Small and the Large. In short, when you look at the night sky and see an unbounded black space sprinkled with bright stars (read above), your eyes trace the four topological dimensions of the local mode of spacetime, which are literally **re-created** and **re-assembled** along null intervals ($\mathbf{s^2 = 0}$), to match the "speed" of light from the light cone.

Keep also in mind that the Platonic *Res potentia* is not organized in **polar** structures, as we have in the local (physical) mode of spacetime, e.g., spin-up vs. spin-down, good vs. evil, etc. For example, we cannot talk about banks of Heraclitean River at rest, with respect to which the 'flow of water' runs in particular rate of 'water (events) per second'. With respect to the local mode of spacetime, *Res potentia* is **non**-relational *absolute* reality, which can be defined only with respect to its *complemental* 'non-reality': an absolute vacuum *presented* in theology as God [John 1:1]. Once we introduce spacetime *metric*, we face the metric paradox above, which can be illustrated with so-called **v**acuum **c**leaner **p**aradox (VCP) along the deflation time toward the Beginning, from Pink Panther: he used super powerful vacuum cleaner to suck in the entire world, including himself, after which the vacuum cleaner sucked itself and disappeared into the blob of gray stuff below (known as "inflation", see Slide **12** in Quantum Spacetime), with duration from 10^{-36} until 10^{-32} seconds after the Beginning [John 1:1]. What happened between 10^{-36}s and 'time zero'? Well, "there was still no time at all" (Yakov Zel'dovich).




Again, the only possible solution to VCP is with Finite Infinity (**FI**) and *dual age* cosmology above. Here we enter the doctrine of *trialism* (Slide **14** in Quantum Spacetime) and physical theology, which I won't have time to explain in this lecture. Suffices to say that we have two *dual* presentations of Nature, God [John 1:1] and (*sit venia verbo*) absolute vacuum; the latter is *purely* mathematical object. Depending on the context, we may use any of the two *dual* presentations of Nature, much like we use both 'quantum wave' and 'quantum particle'. Only in the case of physical theology, we face Kantian 'Ding an sich' and have to use Ludwig Wittgenstein's Proposition 7: "Whereof one cannot speak, thereof one must be silent."

[15]Tamara M. Davis, Charles H. Lineweaver, arXiv:astro-ph/0310808v2, 13 November 2003, Fig. 1.

To sum up, the Beginning at [John 1:1], depicted in the drawing above, is not an event. It is noumenal 'non-reality' *eternally* residing "inside" us (pp. **6-7** in CEN.pdf). It is the ultimate origin of the three forms of reality: *Res extensa*, *Res cogitans*, and *Res potentia*. We cannot prove nor disprove its (undecidable) existence. If we could, **it** (not "He") won't be the First Cause. It is a kind of 'limit' that is beyond human comprehension. We could only hope one day to describe it mathematically, with the new hyperimaginary numbers.

One practical issue remains open: can we produce unlimited clean energy with spacetime engineering (p. **9** in Gravity-Matter Duality)? Yes we can — Robert Geroch[16] is 'not even wrong'. I will be happy to explain my opinion to all people who have subscribed by 10 AM GMT on 21 September 2018. Yes, we can tweak our common global mode of spacetime (Fig. **10** in CEN.pdf, p. **11**). No, it is not "magic": Any sufficiently advanced technology is indistinguishable from magic (Arthur C. Clarke).

For comparison, the alternative to my project **BAVER**, from **b**rain-**a**ided **v**acuum **e**nergy **r**elease, is Wendelstein 7-X in Germany. People there deeply believe it might achieve "up to approximately 30 minutes of continuous plasma discharge in 2021." If confirmed, Wendelstein 7-X will be just 'the proof of concept'. So far over **€1 billion** – all taxpayers' money – were invested in it, as some "potential of stellarators as power plants". But how about the potential of **BAVER** as power plant? My proposal was sent by snail mail to Max Planck Society in **March 1994** (no typo), and again by email on 27 April 2017 (p. **94** in gravity.pdf). Dead silence (p. **20** in Hyperimaginary Numbers). Mind you, the idea of **BAVER** is *very* simple: see [**9**] above and Fig. **10** in *Panta Rei*: The Evolution Equation. Contrary to Bob Geroch's belief, the *potential* future is never fixed "once and for all" [**16**], because it is ***flexible*** (not "uncertain", as in current QM textbooks), up to 'the unknown unknown'.

Thus, the only way to change the future is to *create* it, within the limits of its *flexibility*. As Henry Ford famously noted, whether you believe you can do a thing or believe you can't, you are right. Our genuine free will is gift from God as **Love** (1 John 4:8). Don't seek fake comfort in some "great supervisor" who makes all decisions for us and tacitly controls us, like his "beloved" puppets. Get real.

Perhaps we only need the Platonic theory of spacetime and new point-set topology, set theory, and number theory to model *Res potentia* with *hyperimaginary* numbers. All the rest is provided by the human brain embedded in the Brain of the Universe, and the Law of Reversed Effort: "To the mind that is still, the whole universe surrenders" (Lao Tzu).

Do you want to watch **BAVER** in action? It's not "magic" but gravitational radiation[17]. Only at this moment the **BAVER** effect is not yet scalable, as Nature does it. But we never know what the future holds in all the things we know that we don't know, and in those still in 'the unknown unknown'.

D. Chakalov
24 May 2018, 17:00 GMT

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[16]Robert Geroch, *General Relativity from A to B*, University of Chicago Press, 1978, pp. 20-21: "There is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes. (O)ne does not think of particles as moving through space-time, or as following along their world-lines. Rather, particles are just in space-time, **once and for all**, and the world-line represents, **all at once**, the complete life **history** of the particle (emphasis mine – D.C.)."

[17]Forget about "GW astronomy": read p. **25** in FRAUD.pdf.

Platonic Theory of Spacetime

Video lecture, 21 September 2018, 10:00 GMT

Ladies and Gentlemen,

Welcome to my video lecture, presenting the Platonic theory of spacetime. My name is Dimi Chakalov; please notice the pronunciation of my family name: ***tcha-KA-lov*** (the accent is on the *second* syllable).

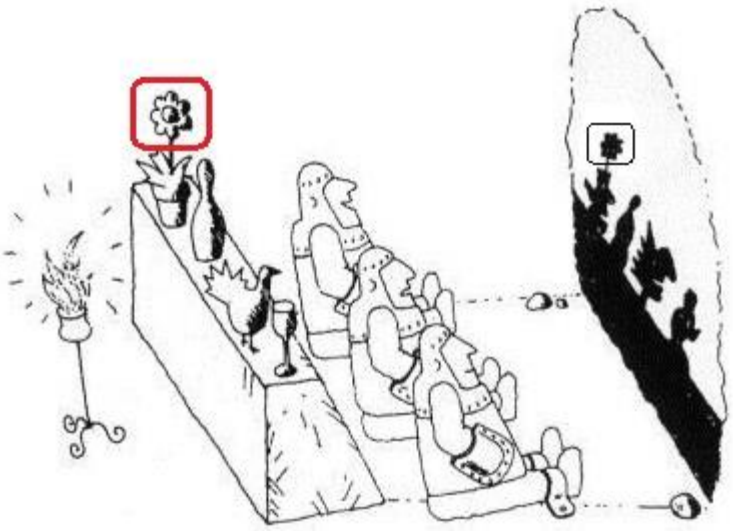
In the first place, I would strongly recommend downloading and printing the lecture notes (**9** pages) supplementing this video lecture: please visit my website, shortcut chakalov.net, and download about_spacetime.pdf. I will try to limit the duration of the lecture to 20 min and also to present the Platonic theory of spacetime at level accessible to people without professional knowledge in theoretical physics and mathematics, yet at many instances I will have to refer to the lecture notes above (e.g., [16] on p. **9**). Feel free to ask questions by email — anything you were unable to understand will be exclusively my fault. Also, keep in mind that I am not a good presenter and that my English is quite limited, as you may have already noticed.

The lecture is organized in three sections: (**i**) what is the Platonic theory of spacetime, (**ii**) where it comes from, and (**iii**) what follows from it. Very briefly, I suggest that the entire Universe follows an *irreversible flow of events*, and interpret every consecutive event 'here and now' as the ***interface*** between the irreversible past and the potential future. Every consecutive event 'here and now' from the *physical* world is treated as **re-created** Platonic "shadow" (see the drawing below) cast in the irreversible past, whereas the potential future holds a special type of Platonic reality, known as *Res potentia*. The latter is neither 'matter' (*Res extensa*) nor 'mind' (*Res cogitans*). I also suggest two *modes* of spacetime: local mode of **re-created** physical world, placed in the irreversible past, and global mode inhabited by Platonic *Res potentia*, placed in the potential future. Because of the so-called "speed" of light, we cannot in principle detect the perpetual **re-creation** of every *interface* 'here and now', and hence the two *modes* of spacetime, local and global, present a *perfect* (Sic!) continuum of four-dimensional events 'here and now, without any observable "gaps" (the latter would resemble the mandatory dark strips separating two neighboring snapshots in a movie reel; see the drawing below). In the last section, I will argue that the Platonic theory of spacetime is *the* only possible theory of quantum gravity, and will also explain its prediction about spacetime engineering, as the physical world of Platonic 'shadows' is modeled as the 'brain' of the Universe. All theological implications, pointing at The Gospel, are kept at minimum, to make the lecture as simple as possible.

In general, the Platonic theory of spacetime introduces a new (to mathematicians and physicists) state of the entire Universe as ONE entity, which is not comprehensible to us (cf. Slide **14** in Quantum Spacetime), as our cognition is inherently relational. **It** (not "He") is neither 'matter' (*Res extensa*) nor 'mind' (*Res cogitans*), but Platonic *Res potentia*, placed in the potential future (the so-called global mode of spacetime). In addition, the Platonic theory of spacetime is fundamental **pre-geometric** theory aimed at uncovering the *origin* of geometry. This task is purely metaphysical and also highly non-trivial. Compare it, for example, with the explanation of 'heat': it can be reduced to kinetic energy, as we know from school, whereas in our case we cannot, not even in principle, show the

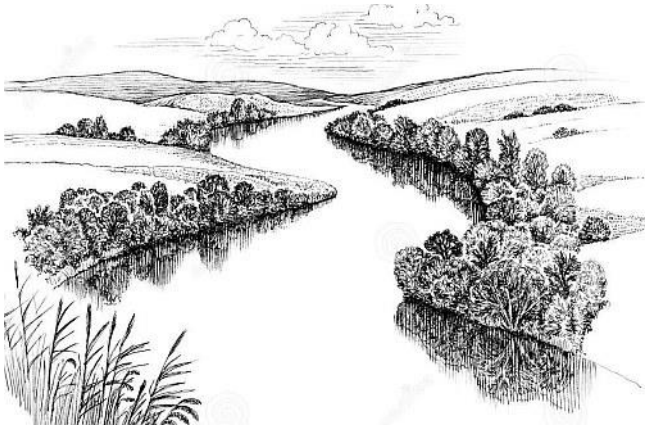
underlying **pre-geometric** plenum dubbed "**it**", as suggested by Plato below. Why not? See **A2** in Slide **19** in Quantum Spacetime.

Let's start from first principles. Recall Plato's Cave (see above) and consider, for example, a Platonic flower (marked with **red**), which we, as 'chained observers', can see only as *physicalized* "shadow" cast from the **unphysical** Platonic flower on our 4D **physical** world (marked below with **black**), endowed with three spatial and one temporal dimensions:



Plato pictured us as 'chained observers', to stress that we cannot 'turn around' and look straight at the Platonic source of our **physical** world, along the radius (Sic!) of the "expanding" balloon (Fig. **4**, p. 7). Our **bodies** are *physicalized* 4D shadows as well, which we call *Res extensa*. As to our soul, mind, self-consciousness, memory, volition, etc., which we label with *Res cogitans*, they are also kind of "shadows" from their Platonic source, which can *penetrate* the 4D physical world only to the extent to which our brains would allow this to happen, like neural "filters" for Platonic ideas (explained later). Thus, the **unphysical** Platonic *Res potentia* is considered the common source of both the physical world (*Res extensa*) and the subjective world (*Res cogitans*), yet **it** (not "He") can never be *directly* observed (Fig. **4**, p. 7) due to the "speed" of light (**A2** in Slide **19** in Quantum Spacetime).

Next, recall the irreversible *flow* of 4D events, pertaining to **all** *physicalized* "shadows" above, which can never be *directly* observed either: Heraclitus' *Panta Rhei*.



Everything changes and nothing remains still —
you cannot step twice into the same stream.

But why is the most important element of Nature, which we call 'time', totally hidden to *physical* observations? Because if Plato's wall and Heraclitus' river above were produced by any *physical* phenomena, they will have to be *relational* (not absolute, p. **7** above), and then we could ask questions about the **banks** of Heraclitus' river 'at rest', the *direction* of the flow of events, the "rate" of time (one second per second?), the physical engine of the river, the common *source* of Platonic ideas and their ultimate origin, etc., *ad infinitum*. This is the inevitable problem of any *reductionist* approach to Nature. Aristotle was fully aware, many centuries ago, of this 'dead end' and suggested the only possible solution: the Unmoved Mover (p. **2** above). It is *perfectly* hidden, along with the Platonic *Res potentia*, ***by*** the so-called "speed" of light: check out again **A2** in Slide **19** in Quantum Spacetime.

Before going into the verification of the Platonic theory of spacetime with indisputable facts from theoretical physics, mathematics, and life science ([14] on p. **7**), let me answer a simple question: do we really need this heavy metaphysical theory? Yes we do. Our theory is like a navigation map, showing the most likely location of an enormous, perhaps unlimited, hidden treasure: quantum gravity and spacetime engineering. If our 'map' has been correctly designed, we *might* have a chance to discover our 'treasure', for example, BAVER (p. **9** above). There is no other way to proceed. Follow me, if you're interested and ready to work. Alternatively, if you prefer the current GR textbooks (e.g., [16] on p. **9**), this video lecture is definitely not for you – don't waste your time any more.

Have you ever wondered *why* Planck's constant and the "speed" of light have fixed **finite** values? What phenomenon could possibly make them *constants*? Any viable theory of quantum gravity should be able to offer some plausible explanation, and the Platonic theory of spacetime offers a very simple explanation based on the bootstrapping holistic effect of the so-called global mode of spacetime. We also offer conceptual explanation of so-called quantum waves, which are not caused by any "vibrating" mechanism, like sound waves: the current QM textbooks are conspicuously silent about the *source* of quantum waves. As to gravitational waves (GWs), see [17] on p. **9** above. As a bonus, we can explain brain correlations ([14] on p. **7**) facilitating the binding phenomenon and brainwaves. To trace Planck's constant and the "speed" of light to the topology of spacetime, let me elaborate on the global mode of spacetime (p. **3**). Have you seen holomovement of fish?

Suppose every fish follows the rule 'think globally, act locally', such that every 'point' from the trajectories of each and every fish is **pre**-correlated (Leibnitz' pre-established harmony) with 'the rest of fish' from the shoal. The correlation "takes place" in the so-called global mode of spacetime: the **atemporal** bi-directional negotiations ("thinking") of

every **next** state along the local trajectories of **all** fish are **already**-completed (Sic!) at the very instant $\mathbf{t_n}$ at which every fish executes its **pre**-correlated *infinitesimal* displacement $\mathbf{t_n} \rightarrow \mathbf{t_n} + \mathbf{dt} = \mathbf{t_{n+1}}$ (compare with [16] and the GR mantra at this http URL).

In the quantum-mechanical version of the story above, replace fish with dice. Think of four dice, which you toss in the air, after which they drop on a table. All dice have to be correlated "in the air" (global mode of spacetime) in such way that the sum of their readings must be **already** (Sic!) confined in the interval [10, 20] at the instant they are fixed/dropped on the table. You can see only four dice *on* the table, where they exist as 'facts' (local mode of spacetime). Suppose you observe four consecutive sets of readings, (3, 5, 1, 6), (6, 4, 3, 5), (5, 6, 2, 6), (1, 3, 5, 1), all of which are **pre**-correlated by the 'global' requirement [10, 20]. The trajectories of all dice are comprised only by their *physical* states 'on the table', which are **pre**-correlated (Henry Stapp) like the shoal of fish above. They will be bootstrapped into holistic 'shoal of dice' and will display wave-like holomovement, without any *physical* source (Erwin Schrödinger) of such "wave" endowed with *complex* (not real-valued) phase (Chen Ning Yang).

The same phenomenon works in your brain [14], while you've been reading these lines. If the human brain seems too complicated, think of a centipede: how does it correlate its legs? With some invisible "dark" computer, which does not emit nor reflect light? I can't help but quote Sir Arthur Eddington: "Something *unknown* is doing we don't know what." Nowadays people may even be awarded Nobel Prize in physics, as in October 2011, for proving Sir Arthur right, namely, "for the discovery of the accelerating expansion of the Universe". Three years earlier, in 2008, I suggested *the* alternative explanation of the alleged "expansion" of spacetime (read p. **2** above), but nobody even mentioned it.

Again, the **self-action** of the Universe ("something *unknown*", Sir Arthur) is related to the topology of spacetime and to the **two** types of infinity, actual/completed infinity (relevant to the local mode of spacetime) and potential infinity (global mode of spacetime). Let me explain the puzzle of **self-action** of the Universe (p. **3**), along with the quantum of action and the **cutoff** on the *local* mode of spacetime, known as "speed" of light. Just think outside the box and recall the discussions of the proposals by Plato (p. **10**) and Heraclitus (p. **11**): the global effects of the global mode of spacetime, pertaining to the entire Universe as ONE, are *physicalized* into local effects in the local mode of spacetime, yet their global origin cannot *in principle* be traced back to any physical object. This is why the *physicalized* local effects, originating from 'the Universe as ONE', are called by some people "dark", including the alleged non-baryonic "dark matter". Following the same twisted "logic", these people should call the gravitational rotation and vacuum energy density "dark" as well, and then collect their Nobel Prize in physics, as in October 2011.

There is no "dark" stuff whatsoever. It is not like spreading "dark" butter on a hot toast, as I said on different occasions — we always have 'bread' and nothing but 'bread', only now the toast has become **self-acting** and "quasi-local", like the fish above. The same applies to all living (Nicolas Bernstein, p. **7**), quantum, and gravitating system (p. **4**). Very briefly: recall the analogy with four dice above, which display four sets of physical states (**3**, 5, 1, 6), (**6**, 4, 3, 5), (**5**, 6, 2, 6), and (**1**, 3, 5, 1). Consider the first one, showing four pre-correlated physical states: 3, 6, 5, and 1. Every *complete* state of this dice includes its potential Platonic state (highlighted with **red**), which is shared, in their global mode of spacetime, with the rest of dice from their 'shoal of dice': (3+**0**), (6+**0**), (5+**0**), and (1+**0**). Namely, the potential Platonic stat**e** (never in plural) is **always** *totally* eliminated, both *before* and *after* the dice displays its four consecutive *physicalized* states, which was duly noticed by Erwin Schrödinger in 1935. The same phenomenon applies to gravity, because the *gravitational* stress-energy-momentum and angular momentum are also potential Platonic stat**e** of every gravitating system. If people treat them as physical states, they will have to be "dark", as I mentioned above, and the gravitational "field" will be some kind of physical field. Big error. Read about the gravitational "pizza" in Gravity-Matter Duality.

Next question: why are Planck's constant and the "speed" of light *constants*? To use again the analogy with a shoal of fish above, the bootstrapping holistic effects of their global 'shoal' are constants, because they have *the same* magnitudes for every quasi-local fish. The latter are governed by the principle of locality *as well*, just as all neurons in the human brain [14] are connected by neural networks *as well*. It's a local-and-global **bundle** (p. **3**), ***rendered*** with actual/completed infinity and limited to the "speed" of light.

Last but not least, let me stress that the topological property of spacetime, which is called here Finite Infinity (p. **3** and p. **5**), **requires** numerically finite but physically unattainable "boundaries" of spacetime, such as the "speed" of light, Planck's constant, Planck length, and 10^{-36}s "after" the Beginning at time zero (p. **8**). These "boundaries" pertain to the *physicalized* world of "shadows" (cf. Plato's metaphor above), which is ***rendered*** and assembled with actual/completed infinity, and is called *local* mode of spacetime. The latter has numerically finite but physically unattainable **cutoffs**, and inhabits the irreversible **past** of every 4D event 'here and now', called 'atom of geometry' (p. **1** and p. **17**). On the other hand, the Platonic *Res potentia* is placed in the **unbounded** (Sic!) potential future of the same 'atom of geometry', thanks to which the Dragon (p. **3**) can never *actually* bite its tale viz. *actually* reach these **cutoffs**. Once created [John 1:1], the Universe is *already* eternal, because its "beginning" and "end" are *physically* eliminated (hence the need for so-called hyperimaginary numbers, $|\mathbf{w}|^2 = \mathbf{0}$).

This is a brief outline of the Platonic theory of spacetime. Now let's move to the second part of the lecture and explain the *origin* of our theory (see (**ii**) on p. **10**) by zooming on some perplexing axioms in metageometry, starting from Euclid's definition of 'point' — "that which has no part". I will show the existence of 'points' (see Fig. **5** below) and will elaborate to the ideas of 'limit' (after Augustin-Louis Cauchy) and 'infinity' (actual vs. potential infinity), briefly mentioned on p. **5** above. At the end of the day, I hope to convince you that our theory is both the only possible and the optimal one. I will argue that, to the best of my knowledge, no alternative metageometry can possibly exist, and also that the solutions to many outstanding problems in Mathematics, offered with our Platonic theory of spacetime, are unique. It is like assembling pieces from the jigsaw puzzle of Nature, which fit in their unique places effortlessly.

Let me demonstrate a process, which has a 'limit' at which it **must** end, because at this limit we obtain a 'point' — "that which has no part" — and the process must **stop** there. I call this **endpoint** 'atom of geometry' (p. **17**). The process (not the atom of geometry itself) reaches the limit of (bounded and monotonic) sequence of increasing **n**umbers of polygon's sides **n**, as depicted in the drawing below (borrowed from Wikipedia).

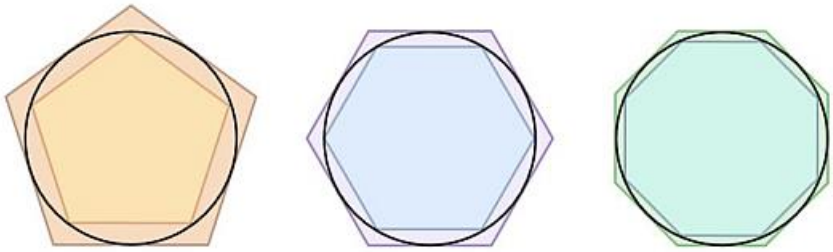
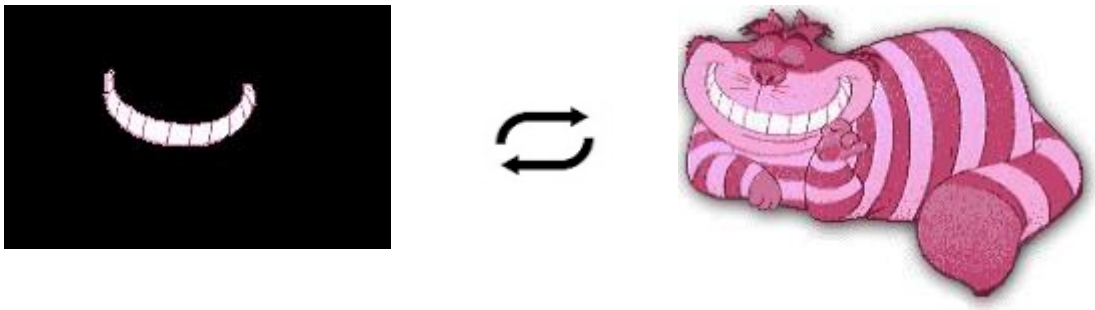


Fig. **5** in Hyperimaginary Numbers, p. **8**

The sequence above has unique *limit* at "infinity" (**n** ≡ **∞**), in the sense that we *imagine* (Sic!) that at this endpoint the side of the inscribed polygon becomes ***identical*** to the side of the circumvented polygon. We denote the two **identical** sides with *infinitesimal* **ds** and stress that **ds** does not have *metric* any more — there is no underlying spacetime to define any metric — and therefore we cannot attribute any rational number to its "size". It is just a geometric point from the circle, neither "small" nor "large". It has no matter anymore. It has become *pure* geometry, like the grin of Cheshire cat *without* the cat.



If we nevertheless suppose that **ds** were 'the smallest pixel of spacetime' with metric, say, the Planck length (10^{-35} m), we could reproduce any *finite* region of spacetime, e.g., 1m by $10^{-35} \times 10^{35} = 1$. However, at **ds** the Archimedean topology (read below), which pertains to the physical world (local mode of spacetime), is **not** valid any more: the atom of geometry is "that which has no part". It is neither 'finite' object nor "zero" (empty set). It has become *Res potentia*, a new kind of reality "just in the middle between possibility and reality" (Werner Heisenberg). Physically, it will look like 'pure geometry'.

Let me explain **ds** with Thomson's lamp paradox. The paradox underlines the two ontologically different forms of 'infinity': actual/completed infinity and potential infinity. The former can be explained with the famous story about a bartender:

> An infinite (*actual* infinity) crowd of mathematicians enters a pub. 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.

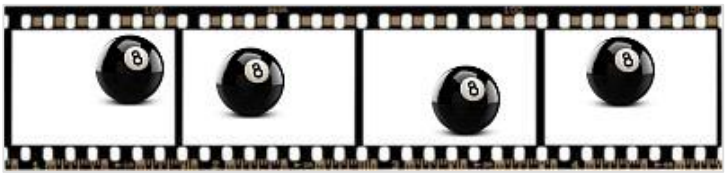
The bartender does not have to count the "number" of mathematicians, just as we don't have to count the "number" **n** of polygon's sides in Fig. **5** above. All engineers, for example, use calculus like the bartender above. We just calculate the 'limit', and it works

perfectly well. But in Thomson's lamp paradox, we *also* use potential infinity, as every definable state of the lamp, either 'on' of 'off', is the necessary and sufficient condition for the *next* definable state, *ad infinitum* (cf. pp. **21-26** in Hyperimaginary Numbers).

First, let me explain what we mean by Archimedean topology based on the Archimedean Axiom. Suppose you have two timbers with different length, 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, you can produce a timber larger than B, say, if k = 4, then 4 x 3 = 12 > 10. But you can never reach some "infinitely large" timber and **stop** there. Ditto to the opposite case of going toward "zero timber" depicted in Fig. **5** above. Hence the Archimedean topology is based on **potential** infinity, whereas the case of *the* largest two-pint beer above employs **actual** (completed) infinity (Georg Cantor). To cut the long story short, the alleged Dedekind completeness cannot solve Thomson's lamp paradox. Here's an excerpt from Wikipedia:

> Consider a lamp with a toggle switch. Flicking the switch once turns the lamp on. Another flick will turn the lamp off. Now suppose that there is a being able to perform the following task: starting a timer, he turns the lamp on. At the end of one minute, he turns it off. At the end of another half minute, he turns it on again. At the end of another quarter of a minute, he turns it off. At the next eighth of a minute, he turns it on again, and he continues thus, flicking the switch each time after waiting exactly one-half the time he waited before flicking it previously. The sum of this infinite series of time intervals is exactly two minutes.

What is the state of the lamp at *exactly* two minutes? Is it 'on' or 'off'? The bartender above doesn't have to address such question. He uses only **actual** (completed) infinity, and his two-pint beer is a dead frozen chunk of matter: "nothing ever moves therein; nothing happens; nothing changes" (Bob Geroch). All living organisms [14] and quantum objects (Erwin Schrödinger and Werner Heisenberg) **require** Platonic *Res potentia* as well, viz. the global mode of spacetime endowed with potential infinity: read p. **14** above. Notice also the implementation of potential infinity in Thomson's lamp paradox: flicking the switch is **not** instantaneous — it will always take some (local mode of) time, no matter how brief, to execute it. Thus, 'flicking the switch' is like the **dark strip** in the movie reel below, separating consecutive shots, and the spacetime of Thomson's lamp is **not** continuous.

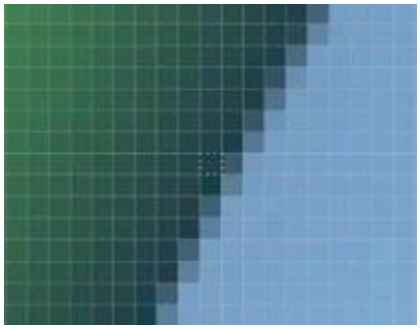


The **dark strip** *and* the entire ***unexposed*** dark reel are not 'background' in any shape or form whatsoever. If they were 'background', we would have to choose between two exhaustive alternatives: either the **dark strip** is a trivial 'empty set', in which case all four black balls will be superimposed on one slide (there will be no 'time as *change*', because there will be only **one dead frozen** black ball), or the **dark strip** is part and parcel from the physical world, in which case it will have some *finite* spatial extension and duration.

The global mode of spacetime, on the other hand, eliminates *completely* such 'dark gap', as explained with the shoal of fish above and the Dragon biting its tail: see Finite Infinity (**FI**) on p. **3** above. **FI** is "finite" in the sense that it can reach **absolutely** (Sic!) all points *en bloc* (p. **6** in Penrose-Norris Diagram), yet **FI** is also "infinite", because it can never reach *any* 'limit' and inevitably **stop** there, like the endpoint from the circle in Fig. **5** above.

Unlike the movie reel above, there is no 'dark gap' in what we dubbed 'atom of geometry', hence the resulting local mode of spacetime is ***perfect*** continuum: the irreversible **past**, the potential **future**, and their *interface* (Sic!) called 'here and now' make together one **indivisible** 'atom of geometry'. Every consecutive **past** state is the necessary and sufficient condition for the existence of its **next** potential **future** state, *ad infinitum*. Stated differently, the Dragon both bites its past tail in the irreversible **past** (local mode of spacetime) and is trying to reach its future tail in the **next** potential **future** (global mode of spacetime), *ad infinitum* (p. **3** in Penrose-Norris Diagram). This is the atom of *geometry*. We suggest *pre-geometric* theory of spacetime. The current differentiable manifold, which is believed to be "locally similar *enough* (emphasis mine — D.C.) to a linear space" (Wikipedia) and hence might eventually replace the phenomenon of limit (Robert Geroch) shown on Fig. **5** above, is valid only to the inanimate macroscopic world with **dead fixed** (not dynamic) gravitational contributions, as in the example with GPS corrections below.

Compare our theory to the current mantra in GR: there is no atom of *geometry* there. The elementary block of spacetime, dubbed also 'event', resembles a single pixel in digital image, separated from the neighboring pixels by colorless strips (see below), just like the invisible strips from the movie reel above. Every individual pixel is necessarily "colored" by matter or physical fields, like the nail varnish below.



The 'chained observers' (p. **11** above) can see *only* colored nails: the **intact** 'bare nails', dubbed *Res potentia*, have **exactly zero** chance to exist as physical ("colored") reality. Stated differently, the grin of the cat *without* the cat above is *Res potentia* as well. It enters the (colored) physical world only as 'geometry' placed only in the *irreversible* **past** in the atom of geometry. Details in Table **1**, p. **14** in The Spacetime.

Again, we use the two ontologically different forms of 'infinity', actual/completed infinity and potential infinity, to explain the topology of the atom of geometry, as mentioned in p. **5** above: the physical world (local mode of spacetime) of 'two-pint beer' is **assembled** by actual infinity in the irreversible **past**. On the other side of the *interface* 'here and now', we have the potential **future** (global mode of spacetime) of the same atom of geometry, inhabited by the Platonic state of Thomson's lamp, in superposition (à la Schrödinger's cat) of its two states, either 'on' or 'off'. The elementary "shift" along the Heraclitus' River, called *infinitesimal* **ds** (see Fig. **5** above), is made by the **self-action** (p. **3** above) of the Universe as ONE, also known as God [John 1:1], in line with the doctrine of *trialism*, Slide **14** in Quantum Spacetime.

If people believe that the Platonic theory of spacetime is "speculative", compared to the current speculations about spacetime (e.g., [16]), I will be happy to demonstrate the blatant errors and totally unacceptable mathematical poetry in the mainstream model of spacetime. A very simple example: consider ten individual apples in a row (like snapshots

from the movie reel above), labeled with numbers from 1 to 10, which make a *closed* interval [1,10]. Fine, but if you replace these apples with spacetime "points", you will have to consider only an *open* interval (1,10) of *eight* points: [2,9]. However, you could not count spacetime "points", because they are *uncountably* infinite. You may not even *think* about "individual" viz. countable points, yet the crucial *endpoints* of spacetime manifold, which define the *entire* spacetime of the universe, are inevitably present in the current spacetime models, such as the Penrose-Norris Diagram. Thus, the statement that "the universe is isolated, or else we should be including whatever influences it as part of the universe" (S.M. Carroll), is false. The universe cannot be *physically* isolated with/by any *physical* entity, because any physical stuff will belong to the physical universe. The latter can be "isolated" from itself only by the **unphysical** *geometric* object called here *Res potentia*, which **wraps** the entire physical universe, as explained with Finite Infinity (**FI**) and the *atom* of geometry above. The snapshots from the movie reel above show the deceptive idea of *denumerable individual* objects, which have nothing in common with the unphysical geometric endpoints in Fig. **5** above. We need new metageometry and new Mathematics to present the Platonic *Res potentia* placed both "below" the infinitesimal **ds** (Fig. **5**) and "above" the largest cosmic structure in the universe, with size (**∞** – **ds**). **It** is dimensionless mathematical entity ("that which has no part", Euclid), like the grin of the Cheshire cat without the cat above. It has no metric, being neither large nor small, yet it is "stretched" in the *global* mode of spacetime to the "size" of the entire physical universe. **It** (not "He) wraps the entire physical universe, yet it does not belong to the physical universe, or else you face the insoluble *metric paradox* above. Now recall the black billiard ball above and think of it as quantum object endowed with *potential* quantum states (Werner Heisenberg) comprising its *atemporal* quantum wave: it will be equally easy (Sic!) to the quantum ball to "jump" (Erwin Schrödinger) into any of its four *physicalized* states above — even if these states are space-like separated (Henry Stapp) — and the *physicalized* balls will be bootstrapped into a holistic shoal of balls.

This is Quantum Spacetime. There are no "quantum jumps" (cf. Erwin Schrödinger, p. **9** in FRAUD.pdf) in the quantum world. The stochasticity of the *physicalizable* quantum objects viz. their probability-for-observation by inanimate measuring devices are just artifacts of classical spacetime: Dead matter makes quantum jumps; the living-and-quantum matter is smarter. All living organisms [14] and gravitational systems are endowed with their Platonic *potential* states as well.

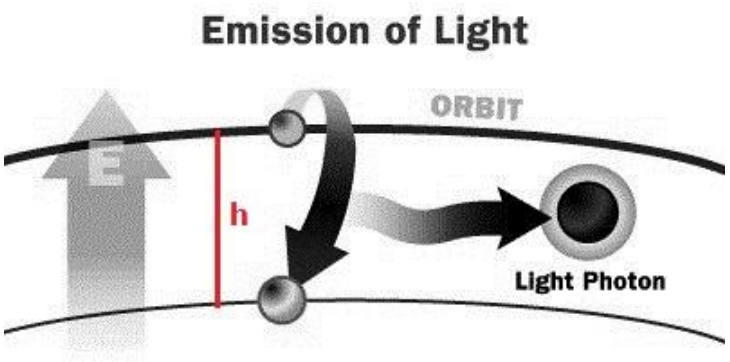
Here comes the third part of the lecture (see (**iii**) on p. **10**). Due to the lack of time, I will skip physical theology (mentioned on p. **8** above) and will elaborate only on the basic ideas in quantum gravity (pp. **3-4** above) and in spacetime engineering.

Recall the contribution of 'pure geometry' to the physical world (the Cheshire cat above), as described eloquently by John A. Wheeler: Spacetime tells matter how to move; matter tells spacetime how to curve. I suggest to *enrich* the contribution of spacetime to matter: the metric field ("spacetime has its own rods and clocks built into itself", MTW p. 396) **reproduces** all effects of gravity, *including* gravitational rotation [6]. Check out pp. **23-25** in Hyperimaginary Numbers and keep in mind that **all** contributions of spacetime (the *grin* of the cat above) to matter (the cat above) are *physicalized* in the irreversible **past** from the atom of geometry — once-at-a-time (**t_1, t_2, t_3, …**), as read by a clock. We observe only the end result from 'quantum spin', not the *atemporal* process erected on 'null spacetime distances' (Kevin Brown). Likewise, we observe only the end result from gravitational rotation: the *atemporal* torsion is always nullified — once-at-a-time, as read by a clock. The latter reads the real time **t** from the inflating balloon analogy (Sir Arthur Eddington) viz. from the scale factor **a(t)** needed to "run" the Friedmann equations.

But the cosmological time **t** has two components: a real component (t_1, t_2, t_3, …) *within* the **3D** surface of the inflating balloon, and a *hyperimaginary* (Sic!) component along the *atemporal* **radius** of the inflating balloon. The latter is *always* nullified (read above) in the physical world, yielding a *perfect* **4D** continuum of events, dubbed here 'local mode of spacetime'. Mathematicians (e.g., John C. Baez) have no idea how to make a *perfect* continuum. There is only one solution to this outstanding puzzle: the atom of geometry.

As to spacetime engineering, read carefully the explanation of Fig. **10** in CEN.pdf. There is no "magic" (Arthur C. Clarke) in quantum gravity and spacetime engineering, just as there is no "magic" in the human brain [13]. Take, for example, Steven Frayne (a.k.a. Dynamo):

He did not emit "energy in the form of gravitational waves" (Wikipedia) to decrease the kinetic energy of the water and freeze it. The laws of thermodynamics are not valid here. Again, this is not "magic" (Arthur C. Clarke) but spacetime engineering harnessing the quantum vacuum. What matters here is that theoretical physicists are very reluctant to acknowledge that we cannot explain even the simple fact of creation of light: see the drawing below and read about the "experiment" on p. **3** in Hyperimaginary Numbers.



There is no *physical* source of photons, waiting patiently 'out there' to be released upon electron "jump", just as there is no *gravitational* stress-energy tensor (Erik Curiel): both gravity and the quantum vacuum are *Res potentia*, and not 'physical reality out there' (p. **8** in [17]).

People are invited to believe that the freezing of water above were "magic", because the joint system 'water & Steven Frayne's body' is governed by *conservation of energy* (Sic!), yet Steven Frayne's temperature obviously didn't surge after "absorbing" kinetic energy from the water. **False.** Similar error is made by many theoretical physicists, who wrongly assume, based solely on wishful thinking, that the so-called Hulse–Taylor binary was also

governed by *conservation of energy* (Hans Ohanian); otherwise they could not apply their mathematically unclear geodesic hypothesis (Alan Rendall, Sec. 9.6) and so-called principle of inertia (Kevin Brown). They further stipulate that the binary *might* have decreased its kinetic energy "because" it has emitted "energy in the form of gravitational waves" (Wikipedia), which is of course red herring [17]: there is no *conservation of energy* in the quantum-gravitational world governed by the fundamental *flow of events* (Heraclitus). We can talk only about four different instances of energy conservations, pertaining to the different black balls above, but at every individual instance of energy conservation (recall the contracted Bianchi identities) the ball is **dead frozen** due to its instantaneous energy conservation: one-conservation-at-a-time (p. **7** in readme.pdf). Nature is built by different instances of energy conservations, placed always in the **irreversible past** in the atom of geometry. The *flow of events* (Heraclitus) does not exist in the *local* mode of spacetime, because the latter is always 'squared' (Wikipedia) viz. the hyperimaginary **radius** of the inflating balloon above, matching the *flow of events*, is "already" nullified ($|\mathbf{w}|^2 = \mathbf{0}$).

Do not treat gravity as gravitational "pizza": read Gravity-Matter Duality. Do not treat the light photons above like classical billiard balls, somehow "attached" to the electron *before* they were emitted: read Erwin Schrödinger, p. **15** in Hyperimaginary Numbers.

We only need Mathematics to discover the hypercomplex analysis, based on the new *hyperimaginary* numbers ($|\mathbf{w}|^2 = \mathbf{0}$). Once we learn how to explore the quantum vacuum (Peter Milonni) and the gravitational "field", we should be able to produce **unlimited** clean energy (BAVER) and literally save our planet: "the Arctic will be free of sea ice by 2040, much before an earlier estimate of 2070." What if in 2021 (recall Wendelstein 7-X) our experts realize that the Arctic will be free of sea ice by **2025**, much before an earlier estimate of 2040? We must act **right now**. Don't procrastinate, time is running out!

Mind you, I am only scratching the tip of the iceberg here. The whole issue of spin-zero gravitational radiation is immensely important. My initial proposal was from March 1994, and I am very well prepared. Make sure to subscribe by 10 AM GMT on 21 September 2018.

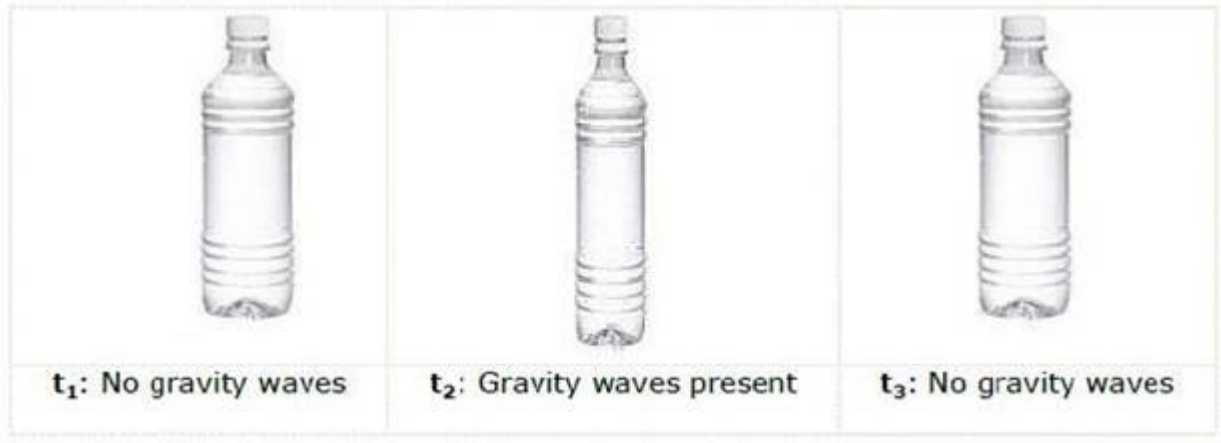
Easter 2018
Last update: Wednesday, 4 July 2018, 13:15 GMT

Addendum A

Do you have modern smartphone? Read 'Real-World Relativity: The GPS Navigation System' by Richard Pogge at this http URL (11 March 2017): "If these effects [predicted by the Special and General theories of Relativity] were not properly taken into account, a navigational fix based on the GPS constellation would be false after only 2 minutes, and errors in global positions would continue to accumulate at a rate of about 10 kilometers each day! The whole system would be utterly worthless for navigation in a very short time. The engineers who designed the GPS system included these relativistic effects when they designed and deployed the system. For example, to counteract the General Relativistic effect once on orbit, the onboard clocks were designed to "tick" at a slower frequency than ground reference clocks, so that once they were in their proper orbit stations their clocks would appear to tick at about the correct rate as compared to the reference atomic clocks at the GPS ground stations."

Great, we proved that the Special and General theories of Relativity work. However, can we detect gravitational "waves" (GWs) with LIGO [17]? The "ripples" of spacetime metric

is supposed to stretch-and-squeeze (Kip Thorne) the spacetime '**online**', along the time read with your clock at LIGO [17]. Which mean that, if you have an empty plastic bottle in front of you, the hypothetical GWs will induce *structural* changes in the plastic material of the bottle, at **atomic level**. But how could GWs induce **stresses** (Sic!) in the plastic bottle?



For if gravity can produce stresses in the plastic bottle, then gravity is a *physical* field that can produce stresses in physical bodies. If gravity can alter the kinetic energy of physical bodies, making them cooler or warmer, then gravity is a *physical* field that can interact with physical systems. Alternatively, if gravity is not physical field, yet can act on physical objects, then gravity is a ghost [17].

How will you resolve this puzzle? You will have to explain the "conversion" of "GW energy" (if any) to 5.3×10^{47} joules — an explosion "greater than the combined power of all light radiated by all the stars in the observable universe" (Wikipedia). Yet "the most powerful explosion humans have ever detected except for the big bang" (Kip Thorne) turned out to be **dead silent**, without "any EM or particle emission whatsoever." (LIGO-P1500227-v12, arXiv:1602.08492v4 [astro-ph.HE], p. 9.) Was GW150914 some "miracle" or plain **FRAUD**?

Go ahead, make your best shot. My solution is explained in Gravity-Matter Duality. Read also pp. **6-7** in [17]. We don't accept "miracles".

All these thorny issues could have been resolved thirteen years ago, after my paper 'Are Gravitational Waves Directly Observable?' from 17 July 2005, but the talibans at arXiv.org deleted it without any explanation: read p. 4 in gw_miracles.pdf. Many hundreds of million USD and Euros — all taxpayers' money — for the "advanced" LIGO and LISA Pathfinder [17] could have been saved, and Kip Thorne and his collaborators could not have the chance to fool us again and get the Nobel Prize (and a lot of money). Their slogan is 'fake it until you make it', hoping that in the near future there will be many "advanced" GW detectors all around the world, and the double "discovery" of black holes and GWs with GW150914 [17] will become a fact. What a pathetic nonsense.

Still not convinced? Look at the two alleged GW detections in 1974 and in 2015. A peculiar astronomical object, dubbed PSR 1913+16, has been losing kinetic energy. Fine, but Russell Hulse and Joseph Taylor deeply believed in *conservation* of energy (Hans Ohanian) and decided to explain the leaking of kinetic energy with the old Tanzanian saying:

> How do we know that Father Christmas has a beard? We know it, because snow falls when he shakes his beard.

Then Russell Hulse and Joseph Taylor were awarded Nobel Prize in 1993 for explaining how we could get snow from Father Christmas' beard. Later, in September 2015, three people (cf. Addendum **B**) claimed to have directly detected both "black holes" and GWs with their so-called GW150914, and got the Nobel Prize in 2017 [17].

Fool me once, shame on you; fool me twice, shame on me.

The 2017 Nobel Prize for physics was awarded to a **FRAUD** committed by Kip Thorne and his collaborators [17]. Don't ever say that you knew nothing about it.

D. Chakalov
Saturday, 7 July 2018, 13:13 GMT

Addendum B

Some history. On 3 October 2017, three renowned proponents of GW astronomy, Rainer Weiss, Barry C. Barish, and Kip S. Thorne (hereafter Weiss-Barish-Thorne or WBT), were awarded Nobel Prize in physics "for decisive contributions to the LIGO detector and the observation of gravitational waves", after applying a sophisticated technique developed by Frau Gudrun Müller. WBT knew very well my proposal from 2008, about two *modes* of spacetime (read p. **2** above), but they bluntly ignored it [17]: check out Addendum **A** above and readme.pdf, from chakalov.zip. Let me remind you the facts from the history of GWs.

On 11 October 1922, Sir Arthur Eddington submitted his seminal paper 'The Propagation of Gravitational Waves', which was published on 1 December 1922 (*Proc. R. Soc. London*, Ser. A, 102, 268–282). An excerpt from his abstract: "Einstein had also become suspicious of these waves (in so far as they occur in his special co-ordinate system) for another reason, because he found that they **convey no energy** (Sic! – D.C.). They are not objective, and (like absolute velocity) are not detectable by any conceivable experiment. They are merely sinuosities in the co-ordinate-system, and the only speed of propagation relevant to them is "the speed of thought.""

Some people would claim that Sir Arthur "did clearly elucidate the difference between the physical, coordinate independent modes and modes that were purely coordinate artifacts" (Clifford Will), but the alleged "cylindrical" GWs cannot *in principle* transfer any energy to alter the *structure* of the plastic bottle above. Why? Because the *linearized* approximation of GR (Jose Pereira) makes stress-energy transfer by GWs impossible *in principle*. Read my objections to WBT at this http URL.

Yet we are confident that gravitational radiation (nothing to do with those GWs of WBT) does exist, and many experts in GR have tried to find the correct theory. Nathan Rosen, for example, suggested bi-metric theory in 1973 and argued in 1979 that GWs carry no energy *at all* (*General Relativity and Gravitation*, 10(4), pp. 351-364). To quote from his abstract dated April 6, 1977: "An attempt is made to extend the Wheeler and Feynman absorber theory of electromagnetic radiation to the case of the gravitational field (described by the Einstein linear weak-field equations)". Thus, Nathan Rosen suggested half-retarded plus half-advanced *components* of gravity, which "follow" **null geodesics**.

We have two *components* of gravity: half-retarded (compare with James F. Woodward) and half-advanced (global mode of spacetime, read p. **4** above), "erected" on null surfaces at every point from the circle in Fig. **5** above, and can apply the atom of geometry to gravity as well. The *atemporal* "speed" of gravity matches that of the *atemporal* quantum waves: *Res potentia* does not live on the light cone. It has "the speed of thought", as Sir Arthur wrote on 11 October 1922. The *local* speed of gravitational radiation — *think globally act locally* — is limited by the Brain of the Universe, like the brain waves [14] or the waves in the shoal of fish above. Again, we have two *components* of quantum gravity, local and global. Only the Mathematics of the **self-action** of the Universe is yet to be revealed.

Finally, I wish to elaborate, in the clearest possible way, on my proposal from September 2008 about two *modes* of spacetime, local and global (p. **2** above). But what is 'spacetime' in the first place? It is a common property to all *physical* objects, yet it is *not* physical stuff. For comparison, if all physical objects had particular 'color', we could relate their individual color to particular physical properties (cf. the physics of color), which determine the properties of their reflected light. But when we talk about 'spacetime', we cannot map it to anything physical, and have to resort to our imagination, namely, to the fact that we can imagine some *purely* geometric constituent of the physical world, such that we can always imagine three mutually perpendicular axes pertaining to what we call 'space' and another one modeling what we call 'time' viz. 4D spacetime. Yet again, these four imaginary geometric axes are *not* determined by any local physical stuff (the Cheshire cat) they belong to. Stated differently, the metaphysical phenomenon called 'causality' (read my note to Piotr Chrusciel), the topological dimensions of spacetime, and the origin of inertia [**8**] are determined ***globally***, by "the observable universe and beyond" (Wikipedia). Namely, by the entire Universe as ONE. Details in pp. **23-25** in Hyperimaginary Numbers.

Surely the grin of the Cheshire cat belongs to the cat above, but on the other hand 'the grin of the cat *without* the cat' (cf. the ***colorless*** cube below) is ontologically different entity, neither physical (*Res extensa*) nor mental (*Res cogitans*), yet it can ***act back*** on the physical cat: recall John A. Wheeler above. This may sound like purely metaphysical exercise, but recall that three people were awarded Nobel Prize in 2011 for their discovery of the ubiquitous "acceleration" [11] of the physical cat (observable universe), produced *by* the "dark" [12] 'grin of the cat *without* the cat'. It is as if you throw a ball up in the air and expect after a while to drop down, because 'what goes up goes down', but instead the ball continues to fly up in the sky, until you cannot see it any more. Most importantly, the ball is flying with *acceleration*, faster and faster, which is why some (otherwise smart) people decided to call its new force "dark" [12]. Why "dark"? Because, unlike the physical cat, the omnipresent source of this anomalous new force does not emit nor reflect light.

Fine. *Res potentia* does not live on the light cone — it is "before" light. It ain't "dark" for sure. Physically, it makes its quantum-gravitational 'cat' **self-acting**, like the human brain: read p. **7** above. This is the reason to suggest quantum-gravitational *Brain of the Universe* and the doctrine of *trialism* (p. **8** above).

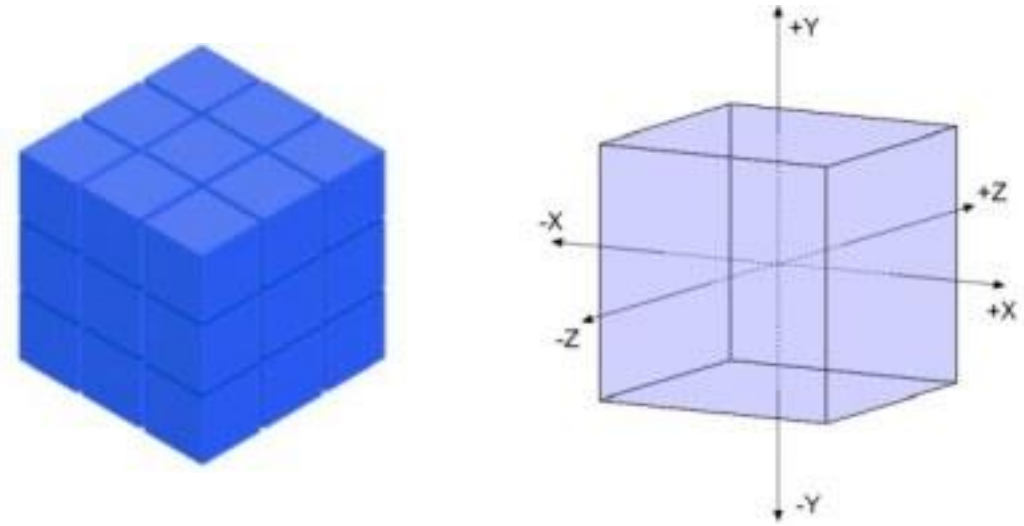
It may be "counterintuitive" to consider the possibility that something we usually picture with drawings on paper (e.g., the trajectory of a ball) and can describe only with our imagination not only produces *real* physical effects, but is the **self-acting** engine of the Universe: the **matrix** (read p. **5** above). Many (otherwise smart) people wrongly called its energy source "dark" and stubbornly ignored my solution with two *modes* of spacetime viz. the possibility for harnessing the **matrix** with spacetime engineering, as noted previously.

To explain the global mode of spacetime as **pre-geometry** — the grin of the Cheshire cat *without* the cat (see above) and also the **intact** 'bare nails', dubbed *Res potentia* — let me compare it to the local (physical) mode of spacetime. The latter (e.g., the Cheshire cat endowed with geometry) has Archimedean topology (p. **16** above) and is always "colored" by "nail varnish", i.e., by matter and physical (e.g., electromagnetic) fields.

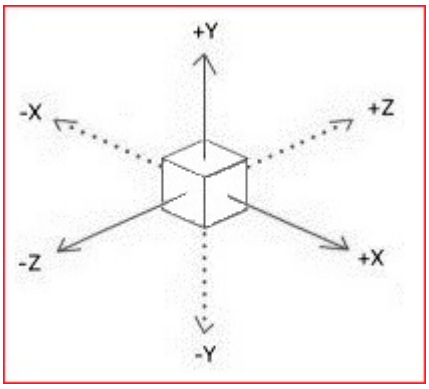
How can we "separate" matter and fields (*Res extensa* in the local mode of spacetime) from its **pre-geometric** Platonic *potential* states (*Res potentia* in the global mode)? In the context of Plato's proposal above, we are 'chained observers' and can see only the *physicalized* cat along with its geometric grin. We can never see the **pre-geometric** 'cat *per se*' and its Platonic **matrix** (*Res potentia* in the global mode), which (not "Who") remains *perfectly* hidden by the "speed" of light (**A2** in Slide **19** in Quantum Spacetime).

Let me again use the blue cube (p. **8** in HBP.pdf), this time as an analogy to the two *modes* of spacetime.

Imagine a cube made of some *colorless* material, with 3 cm rib, painted **blue**, which you cut into 27 little cubes, 1 cm each.



You cannot see the small ***colorless*** cube with rib 1 cm below, which is in the middle of the (physical) **blue** cube above. Its actual "size" is not 1 cm but "zero", like the **undecidable** state of Thomson's lamp *exactly* (Sic!) at the endpoint 'two minutes' (p. **16** above).



It is 'pure geometry', like the dimensionless geometric point from the circle above. It has no metric, does not live on the light cone, and belongs to the *global* mode of spacetime. It

can only cast *physicalized* footprints (real number components) in the *irreversible past* in the atom of geometry. Namely, all **26** *colored* cubes above belong to the *irreversible past* (local mode of spacetime), whereas the Platonic ***colorless*** cube above inhabits the *potential* future (global mode of spacetime). Thus, the atom of geometry has its own structure, dynamics, and topology.

For example, recall the two *modes* of spacetime in Finite Infinity (**FI**) on p. **16** above: in the local mode, pertaining to the irreversible **past** in the Heraclitean *flow* of **4D** (Sic!) events 'you cannot look twice at the same river', all **26** *colored* (physical) cubes above cover **absolutely all** spacetime points (recall the two-pint beer), and the Platonic ***colorless*** cube above is **completely** (Sic!) eliminated (p. **14** above). This physical, once-at-a-time instance from the Heraclitean *flow* of events corresponds to the so-called wave function collapse, which of course cannot kill the Platonic ***colorless*** cube residing always in the global mode of spacetime, namely, in the *potential* future of the same atom of geometry.

In the *inanimate* macroscopic world at the length scale of tables and chairs, described by classical physics, the physical effects originating from the *potential* future (global mode of spacetime) are **infinitesimal** (Wolfram): see **Case I** in Table **1** in The Spacetime, p. **14**. Thus, we have the unique solution to quantum gravity (p. **4** above), without any "dark" *physical* stuff whatsoever. For example, we can think of neutrino's mass, but not about some "supermassive black hole", because neutrino's mass is just a *physicalized* "jacket" dropped in the local mode of spacetime ***by*** the Platonic ***colorless*** 'neutrino *per se*' in the global mode of spacetime: the **matrix** of the Universe (p. **4** above). Simple, isn't it?

To understand the notion of differentiable manifold, think of all **26** *colored* cubes above as the *closest* neighborhood of the final endpoint or limit (see Fig. **5** above) shown with the Platonic ***colorless*** cube above. Now, people believe that this *closest* neighborhood of **26** *colored* cubes is "locally similar *enough* (notice the mathematical poetry — D.C.) to a linear space" (Wikipedia). The same people also believe that "both the gravitational energy density and the spatial stress have been made vanishing" (László Szabados) within the *closest* neighborhood of **26** *colored* cubes, and calculate the fleeting *physicalized* gravitational "jacket" dropped in the local mode of spacetime (read above). They are bewildered by the **nonlocal** nature of gravity (László Szabados), but stubbornly ignore the proposal for two *modes* of spacetime, for over ten years. They are totally brainwashed, like the proverbial priest, who refused to look through Galileo's telescope, in order to preserve his precious "faith". They are old and cannot think any more. I can only hope that many young, and preferably *very* young mathematicians will watch this video lecture. Perhaps one day they will unravel the so-called hyperimaginary numbers and propose the true theory of quantum gravity and cosmology, after which they will compute the effects predicted by my (still in symbolic form) evolution equation and verify them experimentally. Read Max Planck, p. **25** in Hyperimaginary Numbers.

Don't ignore the laws of Nature, as explained by Plato, Heraclitus, and Aristotle. Get real. We only need Mathematics.

D. Chakalov
Tuesday, 28 August 2018, 12:53 GMT

God casts the matrix, not the dice

Einstein's dictum *Gott würfelt nicht!* (4 December 1926) is usually translated as 'God does not play dice', but the proper translation is 'God casts the die, not the dice'. Literally, the meaning of 'die' is similar to 'matrix' in metal molding, but here the notion of 'matrix' is borrowed from Max Plank (p. **5** above). In Platonic theory of spacetime, Einstein's dictum will be interpreted as 'God casts the matrix, not the dice'. Just two examples: the Platonic **matrix** in the human body [14] and in the quantum world (e.g., the proton, Slide **10** in Quantum Spacetime). There is no room for probability here, because the Platonic **matrix** defines and guides the creation and evolution of its biological and quantum-gravitational counterparts with **certainty**. Der Herrott würfelt nicht, wirklich.

But where is the Platonic **matrix**? Read p. **32** and my email from 3 August 2018 below.

D. Chakalov
Thursday, 23 August 2018, 14:58 GMT

Subject: Preferred, external, and absolute time: Yes And No
Date: Fri, 3 Aug 2018 17:39:20 +0000
Message-ID: <CAM7Ekx=RLHVcQcETk5k2tJNt1vdO6p6H-_PA50UafvBNcF8sAQ@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: ita@zurich.ibm.com, claudioborghi60@gmail.com, woodard@phys.ufl.edu, mayeul.arminjon@3sr-grenoble.fr, vitor.cardoso@ist.utl.pt, mtsampa@phys.uoa.gr, anpaliat@phys.uoa.gr, aac@mathstat.dal.ca, a.p.a.kent@damtp.cam.ac.uk, adebened@sfu.ca, sasa.ilijic@fer.hr, giovanni.manfredi@ipcms.unistra.fr, jmartin@iap.fr, daniele.oriti@aei.mpg.de, anastop@physics.upatras.gr, ksavvidou@upatras.gr, helfera@missouri.edu, unruh@physics.ubc.ca, teta@mat.uniroma1.it, dmalamen@uci.edu, seri@math.princeton.edu, steinh@princeton.edu, baez@math.ucr.edu, c.isham@imperial.ac.uk, giulini@itp.uni-hannover.de, erik@strangebeautiful.com, gary@physics.ucsb.edu, hvanelst@karlshochschule.de, kuchar@physics.utah.edu, piotr.chrusciel@univie.ac.at, geroch@uchicago.edu, gfrellis@gmail.com, president@claymath.org
Cc: Joao <j.magueijo@imperial.ac.uk>, Lee <lsmolin@perimeterinstitute.ca>

Two (otherwise smart) people, Joao Magueijo and Lee Smolin, recently wrote in arXiv:1807.01520v2 [gr-qc]:

"Cosmology is characterized by the condition (Sic! - D.C.) that there is nothing outside the Universe, hence if we want to refer to time in a cosmological dynamical equation, it must refer to a reading of a physical clock, which is to say, a function of observables characterizing dynamical degrees of freedom inside the Universe."

Correction: The paragraph above does not explain some "condition", but the metaphysical beliefs of people who stubbornly ignore the proposal from Plato: read 'Platonic Theory of Spacetime' at

http://vixra.org/abs/1802.0397

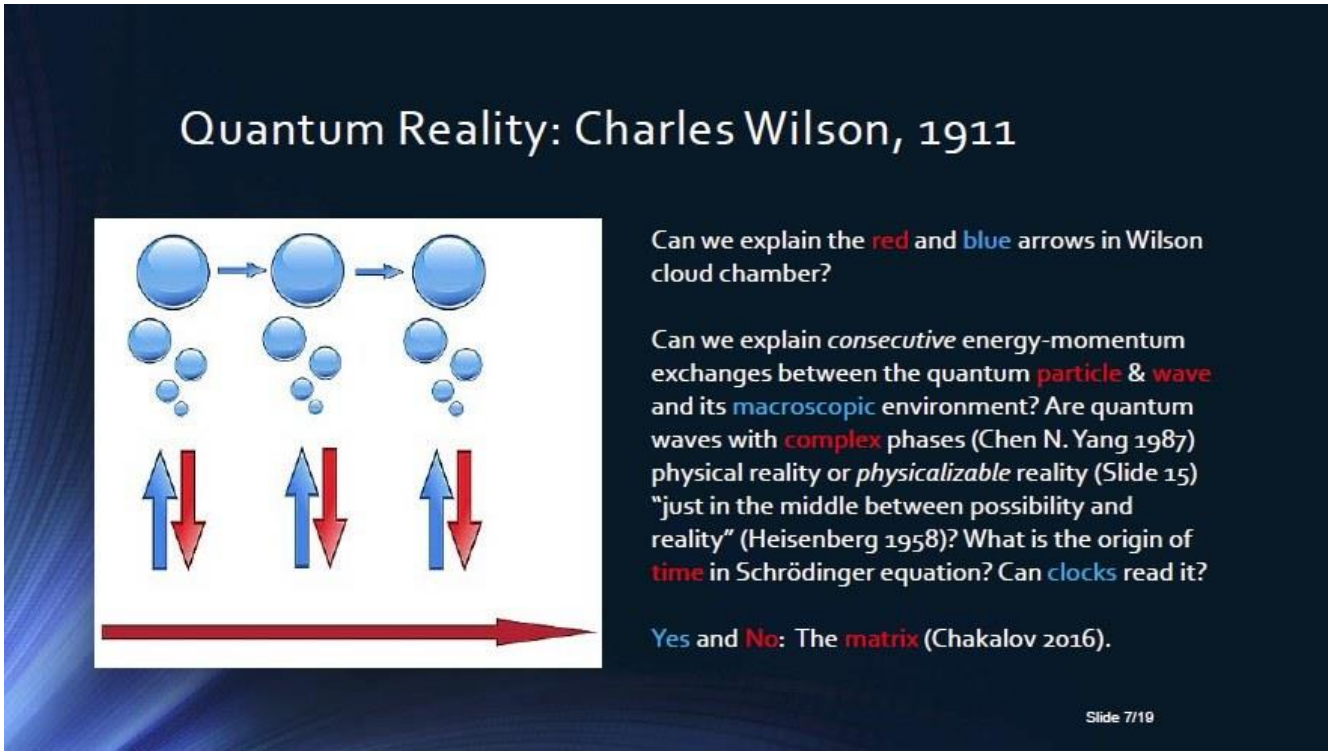
If these people wish to prove that "there is nothing outside the Universe", first they have to define rigorously the concept of 'the entire Universe', and show that the latter is somehow bounded/isolated by some brand new stuff, which is *not* physical any more, otherwise it will belong to the universe. Plato suggested it many centuries ago. No need to invent the wheel. Check out the link above.

As to the subject of this email, see Slide 7 (attached) from 'Quantum Spacetime'; reference at the link above.

Details at my website.

D. Chakalov
chakalov.net

Attachment:



THE COGNITIVE-AND-QUANTUM VACUUM

We can never perceive or detect the vacuum itself, only its manifestations or "jackets". We cannot "turn around" and look *directly* at the common source of mind and matter (Slides **13 and 14** in Quantum Spacetime), as Plato explained with his metaphor. Now, we know what *we* mean by quantum vacuum (Peter Milonni), but what is 'cognitive vacuum'?

It is inherently **UN**speakable phenomenon. Read my posting dated 20 December 1998 ("we operate *simultaneously* on TWO layers, Platonic ideas and their concrete 'here-and-now' explications") and try the experiment with your brain on p. **2** in Hyperimaginary Numbers.

Thus, the cognitive-and-quantum vacuum, along with the doctrine of *trialism* (Slide **14** in Quantum Spacetime), are essential prerequisites for understanding the **Path of God** (read below). You only need to follow the Law of Reversed Effort (p. **9** above) and God as **Love**

(1 John 4:8) will unfold toward you: Ask and it will be given to you; seek and you will find; knock and the door will be opened to you (Matthew 7:7). Stated differently, you should not push your mind in *any* way whatever — only let the Universe as ONE to exercise its unique **self-action**, depicted in p. **3** above. This is the **Path of God.** People will not pay attention to you and you may never become rich and famous. Who cares? You will be just happy.

D. Chakalov
Wednesday, 8 August 2018, 15:00 GMT

THE PATH OF GOD

I announced my theory in a manuscript, entitled 'How to Bind Mind to Matter?' in January 1990 (it was a research proposal, not intended for publication), but no mathematician or physicist has ever shown any interest in my work, for over twenty-eight years. Four years after my first announcement, in March 1994, I sent my proposal by snail mail to Max Planck Society, and again by email on 27 April 2017 (p. **9** above). It is like talking to a brick wall.

People are only interested in spacetime engineering, and I offer them to study thoroughly the explanation on p. **19** above, and then to come back with their questions, stressing that anything they were unable to understand will be entirely my fault — my English is indeed very limited and, on top of that, I am not a good presenter.

Let me try to give you a glimpse of how spacetime engineering works, for reason explained on p. **20** above.

Recall Steven Spielberg's *Indiana Jones and the Last Crusade* (1989). In order to reach the Holy Grail, Indiana Jones had to overcome three severe challenges, the third being the **Path of God** — watch it at YouTube at this http URL and notice the snapshot below.

The **Path of God** is like the quantum vacuum (Peter Milonni), in the sense that we cannot see it directly, but only its manifestation. Hence if you don't know where to look for the **Path of God** and how to find it, you can never learn to practice spacetime engineering and could only advertise parapsychology with some fake "magic", like the water freezing above or fixing the Rubik cube blind-folded. Catch my drift?

D. Chakalov
Sunday, 12 August 2018, 10:10 GMT

PHYSICAL THEOLOGY

Physical theology deals with 'the entire Universe as ONE' (cf. my email from 3 August 2018 above). It is formulated with Maximal Set Theory (MST), announced by the author of these lines on 21 October 2013, one day after the formulation of quantum gravity on 20 October 2013. Due to the lack of interest on behalf of the established academic scholars, MST has been archived on pp. 252-350 in Indefinable.pdf.

To understand MST and the brand new notion of 'zero' in Mathematics, recall the orthodox set theory, in which the idea of 'universal set' leads allegedly to a "paradox" (Wikipedia), as Georg Cantor himself realized in 1890s.

In MST, however, we do not interpret 'the entire Universe as ONE' as a proper 'set', as defined by Georg Cantor in 1874, but as **undefinable** **matrix** pertaining to 'the entire Universe as ONE'. It is the ultimate Platonic idea. Here's the explanation from 16 July 1997:

> Perhaps we could elaborate an agreement on the algorithm for suggesting arguments for the undefinable matrix if we take into account the inverse-proportional relation between the content and volume of concepts: the bigger the volume, the smaller the content. A concept of, say, 'chair', has bigger content and smaller volume than the concept of 'furniture', for example. A very general and abstract concept like 'thing' covers almost anything we could think of, and has minimum intrinsic content. The **limit** of this trend would be some *unspeakable* concept that has infinite volume and **zero** intrinsic content. It will cover all possible concepts, emerged in a dipole-like structure: we could comprehend the concept of "chair" because we can think of something that is "non-chair", and with respect to which the concept of "chair" makes sense. In the case of the undefinable matrix, the *ultimate Platonic idea*, we cannot formulate any concept that is *not* pre-included in it, and therefore we just cannot speak on the meaning of the undefinable matrix. It is one single meta-concept, or rather *the meta-concept* which involves all possible concepts, and there is nothing 'outside' the meta-concept with respect to which we could describe it. Well, I'm sure this sounds very familiar.

Our cognition is inherently relational, and therefore we can comprehend Nature only to the extent to which we can operate with Cantorian sets. The concept of 'reality' can be defined and comprehended as a 'set' *only and exclusively only* if 'reality' can be *related* to the concept of 'non-reality', as explained on p. **8** above. With our human cognition, we

cannot even imagine some "set" of 'reality & non-reality'. We can only conjecture that **it** (not "He") will be the **undefinable matrix** pertaining to 'the entire Universe as ONE'. **It** will be "some *unspeakable* concept that has infinite volume and zero intrinsic content", as I wrote on 16 July 1997 above. Needless to say, the original proposal is from Plato.

Thus, we have two conceptions of 'zero'. In the orthodox set theory, 'zero' refers to some *relational* (not absolute) 'empty set', which is always 'zero of *something*'; for example, I believe that the set of bananas, which you've stuck in your ears as you're reading these lines, has zero cardinality, so this *relational* set is an empty set (Wolfram). In MST, on the other hand, we have a brand new notion of non-relational or **absolute zero**, which we cannot comprehend, because **it** (not "He") has "zero intrinsic content" (see above). Recall the quantum 'school of dice' (3+**0**), (6+**0**), (5+**0**), and (1+**0**) on p. **14**: the non-relational or **absolute zero**, highlighted here with **red**, does not refer to any *physical* 'dice'. **It** is never present in the physical world: the **undefinable matrix**, pertaining to 'the entire Universe as ONE', is Platonic *Res potentia*. Physically, the **matrix** is *always* nullified ($|\mathbf{w}|^2 = \mathbf{0}$) and can *never* be detected due to the "speed" of light (**A2** in Slide **19** in Quantum Spacetime). It is an *absolute* empty set, the true monad without windows, and Kantian 'Ding an sich'.

On the other hand, the *relational* notion of 'zero' in the orthodox set theory can be explained with Baldy's Law 'some of it plus the rest of it is all of it'. For example, you have a set of five bananas on a table in front of you, so three bananas plus two bananas are 'all of it'. But if you eat all five bananas, you will end up with an empty set (Wolfram) of bananas on the table. Obviously, the notion of 'zero' here is *relational* empty set.

Now recall Schrodinger's cat: people would say that it has two *physical* states only, either 'live cat' or 'dead cat', whereas its "wave function" refers to "our knowledge of reality".

False. We are not talking bananas and 'objective reality out there', as in Baldy's Law. The Platonic **matrix** of Schrodinger's cat is an ontologically different *potential* reality, which may be considered 'relational' only to the extent to which it refers to its *physicalizable* explications, 'live cat' or 'dead cat'. However, ***the same*** Platonic **matrix** is also entangled (Wikipedia) with the **undefinable matrix** pertaining to 'the entire Universe as ONE'. Hence God or, if you prefer, 'the entire Universe as ONE', is an *incomprehensible* omnipresent Platonic **matrix** with "infinite volume and **zero** intrinsic content", as stated above.

The beauty of Mathematics is in its power to define things we cannot even comprehend: God as *absolutely* everything, dubbed 'the entire Universe as ONE'. If **it** (not "He") were comprehensible, we would immediately ask questions about its origin, purpose, reason, etc., *ad infinitum*. Thank God, this is impossible.

Acknowledgements

I am deeply grateful to Eugene Higgins Professor Emeritus of Physics and Natural Philosophy at Yale University Henry Margenau for his moral support and encouragement in June 1990, and to my beloved parents Gocho G. Chakalov and Dany Chakalova for their longstanding moral and financial support. They went back home and are now with Jesus.

D. Chakalov
Monday, 20 August 2018, 19:05 GMT

FOR THE RECORD

Let me tell you a story, which I mentioned elsewhere (p. **34** in The Spacetime). In early September 2011, I tried to explain the "speed" of light and the so-called global mode of spacetime (p. **2** above) to a good friend of mine, Stavros, as we were relaxing at Iraklitsa beach near Kavala, Greece. I don't have a photo, but I suppose we looked pretty much like the two guys below.

Imagine, I said to Stavros, that you and I are in a train (local mode spacetime) that runs toward the future. Physically, we cannot "see" the future, because we observe the physical world only in the *opposite* direction toward the elapsed **past**. Why? Because of the "speed" of light: it *always* takes some finite amount of time to see me sitting **next** to you (cf. principle of locality), just as it takes roughly eight minutes to see the **past** state of the Sun. Now, suppose I can jump off the train and move to the global mode of spacetime: the local time will stop (according to Einstein) and I will have all the (global and atemporal) time to watch you, the train, and its **potential** railroad ahead, because *your* local time will be dead frozen, like the proper time of a photon. So I use just one instant from *your* frozen time, and enjoy the entire (atemporal) **global** time available to the train. But when I come back and sit next to you after my "long" walk, you won't notice that I've been "out" for a walk: to *your* eyes and wristwatch, I will **always** remain ***already*** (Sic!) on the chair next to you. You can't see me leaving for a walk "outside" the local (physical) mode spacetime (the train). All you can notice is that I've been EPR-like correlated with all beautiful girls here on the beach, like *that* fish on the sand was correlated in its school of fish before it was caught. And if I have brought you *this* drink from my walk "outside" the train, **you** will see it as surfacing helter-skelter and will of course try to trace it in the *history* of our talk ... but you can't find it there and will have to pronounce it "dark". Capiche? Cheers!

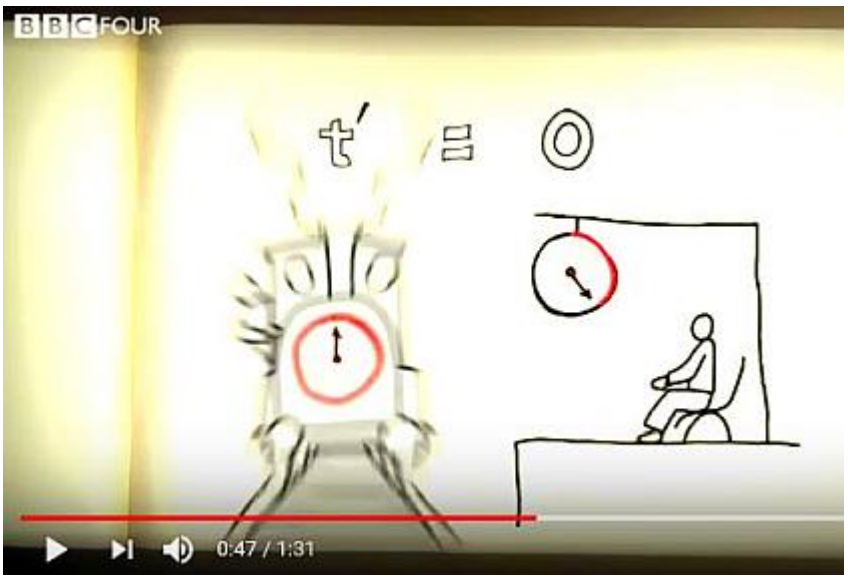
Se non è vero, è ben trovato, people might say. Maybe. But let me tell you another story about trains, which I read many years ago. A man has a dream that he is traveling in a train, having no recollection how he showed up there and why. The train goes on forever, at some point it stops, some of the people around him get off, new people get in, and the train continues. The man has no idea what is the *meaning* of this whole train, where it goes to, and why. At one point, the train again makes a stop, new people get in, but this time the man knows that this is *his* home station and he should get off, which he does. At this moment, he awakes and says, 'what a stupid dream, it makes no sense whatsoever!'

There is nothing wrong or sad to get off the train. Quite the opposite. We simply go back home, as my mom and dad did. Surely the "train" makes no sense to us, but at least we can try to describe the global mode of spacetime with the new hyperimaginary numbers: inside the "train" (local mode of spacetime), these numbers are always **squared** and "already" nullified ($|\mathbf{w}|^2 = \mathbf{0}$). Let me try to be a bit more specific.

Recall the balloon metaphor on p. **6** above: the (hyperimaginary) radius connects God (Luke 17:21) in balloon's center (John 1:1) to each and every 4D point/event from the expanding "surface", and hence the cosmological time, as read with your clock, has two components, as explained on p. **19** above. Yes, the preferred, external, and absolute time along balloon's radius does exist (recall the *metric paradox* on p. **3** above), but — no, we can detect only its *physicalizable* components, one-at-a-time. As Ray Cummings noticed, "Time is what keeps everything from happening at once". Which is why the question about the existence of 'absolute time of *everything*' yields yes-and-no answer. Details in Slides **13** and **14** in Quantum Spacetime; notice the absence of "windows" (Gottfried Leibniz) in Slide **13** and the explanation in Slide **14**. The Platonic *Res potentia* is not only hidden by the "speed" of light (**A2** in Slide **19** in Quantum Spacetime) and by the mathematical fact that the spacetime interval is *always* **squared** (Wikipedia), but also by the constraints of our cognition: we cannot even imagine *Res potentia* as the common source of matter and fields (*Res extensa*) and mind and soul (*Res cogitans*), dubbed "trunk" in Slide **14** therein.

Again, the balloon's center (John 1:1) in the drawing on p. **6** above is not *physically* present anywhere on the *surface* (4D spacetime) of the "expanding" balloon: there is no *physical* absolute spacetime point/event. The absolute time "along" the radius (not shown) of the balloon on p. **6** above is *atemporal* and omnipresent "inside" (p. **24**) all 4D events. Namely, the balloon's center is instantaneously *multiplied*, infinitely many times, "inside" all 4D events constituting the local (physical) mode of spacetime presented with balloon's *surface*, and each and every point from balloon's *surface* is experiencing simultaneous and uniform "inflation" of balloon's *surface*, thanks to which we have spacetime metric and can distinguish between Large and Small: watch 'Powers of Ten' (1977) at this http URL. Physically, there is no dynamics, nothing changes along balloon's radius, that is, "outside" balloon's 4D *surface*. This is the atemporal, **pre-geometric** realm 'outside the train'.

The meaning of 'atemporal' is taken from Einstein's contribution to Special Relativity, depicted in the snapshot below: *relative to* all observers, photon's proper time is believed to be "zero", whereas the photon itself is *atemporal* ("will not have aged", Wikipedia). It will only cast its *physicalized* massless "jackets" 'inside the train', one-at-a-time.



0.47-0.52: "Relative to the platform, time on the train completely stops."
Time Dilation, BBC Four, published on YouTube on December 14, 2010

With the sole exception of the photon (luxon), the entire *physicalized* world, inhabiting the local mode of spacetime, is considered 'retarded light'. Notice also that, in the local mode of spacetime, **t**′ = **0** = $|\mathbf{w}|^2$ (cf. p. **14** above), while in the global mode of spacetime **±w** is *never* squared, as it corresponds to Platonic *Res potentia*. Hence the need for so-called hyperimaginary numbers. To understand the new physics, read Yakov Terletskii, p. **7** and Ref. **15** in Hyperimaginary Numbers. Details will be available until 21 September 2018.

Also, the **red** arrow **W** in the drawing on p. **3** above goes along the radius (not shown) of the balloon above. The same arrow **W** is also depicted in Fig. **5** in Gravity-Matter Duality: the "direction" **W** of Heraclitean *flow* of 4D events (p. **11**) is made **by** the **self-action** of the Universe (p. **3**), which "pulls up↑" the entire physical world ("elevator") *en bloc*, and ultimately creates what we call *inertia* [**8**]. Of course, there is no ideal inertial observer, which is at *absolute* rest (the banks of the Heraclitean river) and can therefore witness the global acceleration of the entire physical world ("elevator") *en bloc* (p. **8** in FRAUD.pdf): we see only the *physicalized* local inertial "jackets", as in the case with Newton's apple. As to the theory of Relative Scale (**RS**) spacetime, perhaps one day we will reproduce [**6**] the effects of gravity (p. **18** above) with *tweaking* the Platonic rods and clocks: "spacetime has its own rods and clocks built into itself", MTW p. 396. If we learn how to tweak **1**m of light-travel **time** (Taylor and Wheeler), we should be able to eliminate (reversibly) the inertia ("the grip of spacetime", Ciufolini and Wheeler) with spacetime engineering and fly in the air with REIM (**r**eversible **e**limination of **i**nertial **m**ass), much like we move our thoughts with our free will (p. **5** in CEN.pdf and p. **2** in Woodward.pdf). **Mark my words.** Surely a physical mountain is much larger and heavier than a physical tree, but what is the difference between the Platonic ideas of 'mountain per se' and 'tree per se'? They belong to their common **matrix** (p. **5** above) viz. to the **UNspeakable undefinable matrix** of 'the entire Universe as ONE' (p. **29** above), thanks to which the *physicalized* 4D world has **free will**. According to Conway-Kochen Free Will Theorem (pp. 26-27), "No theory can predict exactly what these particles will do in the future for the very good reason that they may not yet have decided what this will be! (...) The stage is still being built while the show goes on." Nature is not "uncertain" but ***flexible***. The past state in the *atom of geometry* (p. **17**) is fundamentally underdetermined and ***complemented*** (Sic!) by the **matrix** in the potential future: God casts the matrix, not the dice (p. **26** above). The Universe as ONE is a ***living*** organism governed by **biocausality** (p. **3** above), resembling the human brain.

God does exist, ladies and gentlemen. This is a mathematical fact. You may not like this mathematical fact and pretend that you know nothing about it, as if you've never received email messages from me since 20 October 2013. This is your free-will choice, which shapes your potential future. I can do nothing about it.

My first invitation to many eminent mathematicians and physicists for watching my video lecture was sent in February this year. The last invitation was sent by email to over 140 mathematicians and physicists on Friday, 29 June 2018 — see the last entry in gravity.txt. As of today, 21 September 2018, none of them have signed to watch it (p. **2** above). Even worse, nobody even made the effort to acknowledge my invitation and add something to the effect of I-am-too-busy-go-to-hell [**3**].

I can only find comfort in the wise advice by St. Matthew: "Do not give dogs what is sacred; do not throw your pearls to pigs. If you do, they may trample them under their feet, and turn and tear you to pieces."

D. Chakalov
Friday, 21 September 2018, 09:00 GMT

THE ORIGIN OF INERTIA

> By this formulation one reduces the whole mechanics of gravitation to the solution of a single system of covariant partial differential equations. The theory avoids all internal discrepancies which we have charged against the basis of classical mechanics. It is sufficient—as far as we know—for the representation of the observed facts of celestial mechanics. But, it is similar to a building, one wing of which is made of fine marble (left part of the equation), but the other wing of which is built of low grade wood (right side of equation). The phenomenological representation of matter is, in fact, only a crude substitute for a representation which would correspond to all known properties of matter.

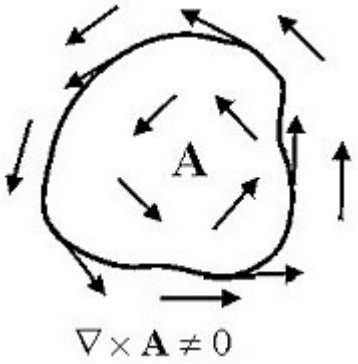
A. Einstein, *Physics and Reality*, March 1936, p. 370.

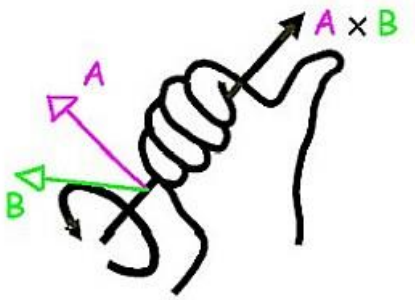
Excerpt from: James F. Woodward, THE ORIGIN OF INERTIA. Copyright © 1998.
https://physics.fullerton.edu/~jimw/general/inertia/index.htm

It turns out that electromagnetic radiation reaction (the reaction force on a source produced when radiation is launched) is neatly accounted for in terms of a combination of "retarded" waves (normal waves propagating forward in time) and advanced waves.
…
Inertial reaction forces are instantaneous; there's no doubt whatsoever about that. When you push on something, it pushes back on you immediately. If they're caused chiefly by the most distant matter in the universe, how can that be?
…
3. When you push on an object a gravitational disturbance goes propagating off into either the past or the future. Out there in the past or future the disturbance makes the distant matter in the universe wiggle. The wiggling stuff out there makes up the currents that cause disturbances to propagate from the past or the future back to the object. They all arrive from the past or future **just in time** to produce the inertial reaction force you feel.
…
Precisely the same thing evidently happens with inertial reaction forces. The act of pushing on something causes a disturbance in the gravitational field to go propagating off into the future. It makes stuff (the "absorber") out there wiggle. When the stuff wiggles it sends disturbances backward (and forward) in time. All the backward traveling disturbances **converge** on what we're pushing and generate the inertial reaction force we feel. No physical law is violated in any of this. And nothing moves faster than the speed of light. It only seems so because of the advanced waves traveling at the speed of light in the backward time direction.
…
We are left with the fact that the least implausible explanation of the origin of inertia is gravitational disturbances that propagate to and from the distant future out there. Support for this view of reality can be found in Wheeler and Feynman's absorber theory that accounts for electromagnetic radiation reaction forces in essentially the same way.

———————

Regarding gravitational rotation, James F. Woodward wrote (ibid.): “You may remember from an undergraduate course in electricity and magnetism that the electric field of an electric charge can be represented by something called a “scalar potential” -- a “function” that assigns a single number to each point in space so that when the “gradient” of the function (the spatial rate of change of the function) is computed you get back the electric field strength (a vector quantity with magnitude and direction). (…) We look at a “test particle”, a massive object that’s so small that it doesn’t disturb any of the stuff it finds itself in. It’s located in a universe much like ours, but to keep things simple we assume that everything in the universe, other than the test particle, is smeared out smoothly throughout space. We now let our test particle move along a straight line in this stuff and ask: What is the force of gravity on the test particle due to the rest of the stuff? In general, both “gravito-electric” and “gravito-magnetic” fields, the gravitational counterparts of electric and magnetic fields, may act. In this case, however, the gravito-magnetic field itself doesn’t act, so we can ignore it. The reason why is that the rest of the stuff out there doesn’t “circulate”, so the “curl” of the vector potential vanishes.”





But in fact **all** gravitating stuff ‘out there’ *does* rotate, as indicated in the drawing (left) from Jim Woodward above, including the entire observable universe: check out the facts in ‘Gravitational Holomovement and Rotation’. The origin of gravitational rotation is either considered “dark”, as in the so-called “cold dark matter”, or is eliminated in GR textbooks by hand (torsion).

Hence the spin of matter from gravity — ***physicalized*** angular momentum producing gravitational **rotation**, thanks to which gravitating systems are **bootstrapped** into ***holistic*** systems, balanced by tug-of-war attraction and repulsion — is swept under the carpet.

Read ‘Platonic Theory of Spacetime’ above. The entire 4D “surface” of the expanding balloon metaphor (p. **6**) is “rotating” along balloon’s radius as well: the expansion & rotation are topological **bundle** (p. **4**). The thumb vector in the right drawing above points simultaneously to **all directions** in 4D spacetime — it only has magnitude (scalar), matching what we call **inertia**. If the *rotational* time rate (Wikipedia) can be decreased to “tick” at a slower frequency (p. **20**), the ***non-tensorial*** Christoffel symbols can be made FAPP zero, the inertia will be nullified and its physical system will be made weightless, and we will fly by REIM (p. **33**). Again, it is about modulating the *rate* of time from gravitational **rotation**.

Mark my words. REIM is not “magic”. The current phenomenological representation of matter (Einstein, p. 370) is essentially incomplete. In Jim Woodward’s hypothesis, the “absorber”, which is supposed to “wiggle”, must be installed *exactly* at null-and-spacelike infinity, just like GW mirrors. As to GR textbooks, look at the geodesic equation (Kevin Brown): if the connection (Christoffel) symbols are not zero, then “all of a sudden (Sic! – D.C.), there appears to be an acceleration” (Jolyon Bloomfield) due to the ***instantaneous***

"grip of spacetime" (Ciufolini and Wheeler), endowed allegedly with "asymptotic flatness" (Jürgen Ehlers) and modeled with Penrose-Norris diagram. **Total jabberwocky**.

Here's why. To model 'the entire Universe as ONE', people use only the physical spacetime (called local mode of spacetime), which offers two ***alternatives***: the spacetime either has some "boundary" at null-and-spacelike infinity, or has not. If you choose one alternative, you must ***reject*** the other one. Can't have your cake and eat it. Hence the mathematical definition of spacetime "boundary" is total jabberwocky. If a light beam is directed toward future null-infinity from any point in the physical spacetime, one day it will either hit some "boundary" à la Chuck Norris, or will never reach it, ever. The latter is *infinite* universe, whereas the former is total jabberwocky spiced with GW mirrors. *The* only possible solution is 'have your cake and eat it', implemented with the so-called Finite Infinity (**FI**): read carefully p. **3**, p. **16**, and p. **25**. Robert Geroch's idea about "local differential geometry ("local" at the points of infinity)" is 'not even wrong'. Mathematically, it is impossible *in principle* to define any "limit" of spacetime ***exactly*** at "zero" or ***exactly*** at "infinity".

Why not? Because in classical geometry the idea of 'limit' requires an *endpoint* that belongs **jointly** (Sic!) to the object with 'limit' *and* to 'everything else in the universe'. Let me explain (see p. **26** in spacetime.pdf). Suppose you enter a tunnel with diameter 3m. As you walk along the tunnel, you realize that its diameter shrinks by 0.1m every 10m from your trajectory. At some point, the tunnel becomes so narrow that *you* (not the tunnel) cannot move further and must stop there. You also claim, after Augustin-Louis Cauchy, that the tunnel *should* have an endpoint dubbed "limit", at which its diameter is *supposed* to be "zero" (the Ghosts of departed Quantities, Bishop Berkeley), so the tunnel will be terminated and must stop there *as well*. Then you bravely calculate the total length of the tunnel, from its entry point to the ***dead end*** called "limit", which belongs **jointly** (Sic!) to the tunnel *and* to 'everything else in the universe'. Compare this to Finite Infinity (**FI**) above and my email from August 3, 2018 on p. **26** in 'Platonic Theory of Spacetime'.

You need *quantum* geometry: **FI** employs *both* **(**open**)** *and* **[**closed**]** sets, in Cauchy space. Why? See the *metric paradox* (Yakov Zel'dovich) on p. **3** and p. **6** in CEN.pdf. The dead end of the physical universe (tunnel) is numerically finite but *physically* unattainable limit or "cutoff" at the so-called Planck length. There is no *metric* there anymore, so **it** (not "He") is *atemporal* Platonic entity, neither 'small' nor 'large'. It does not belong to the *physical* tunnel nor to 'everything else in the *physical* universe'. It is the entire Universe as ONE, residing in the global mode of spacetime, which (not "Who") *emanates* its **physicalizable** "jackets" (p. **3** in CEN.pdf) comprising the physical universe. Plato suggested the core idea many centuries ago. No need to invent the wheel.

In a nutshell, Nature employs two *modes* of spacetime, local (physical) and global (Platonic), which are in perpetual negotiation: *think globally, act locally*. The local mode of spacetime has "its **own** rods and clocks built into itself" (MTW p. 396; see also Taylor and Wheeler), which cannot be derived *in principle* from the physical stuff in it. No way. This unique spatial and temporal structure is the ***imprint*** from the global mode of spacetime. The latter pertains to a new (to people like Bob Geroch, John Baez and John Lee) Platonic state of the entire Universe as ONE, thanks to which the phenomenon called 'causality' (read my comments to Piotr Chrusciel), the topological dimensions of spacetime, and the ***instantaneous*** emergence of inertia (Ciufolini and Wheeler) are determined ***globally***, that is, by "the observable universe and beyond" (Wikipedia) or simply by the entire Universe as ONE. This is my message from 21 September 2008.

Finally, I would like to explain my proposal from October 1998: the asymmetry of time comes from the *asymmetry* of space. I tried to explain it first to Chris Isham, Britain's greatest quantum gravity expert, at Imperial College London during our first meeting on 13 November 1998 (he showed no interest and didn't ask any questions, as if I was talking moonshine). The core idea is very simple: watch 'Powers of Ten' (1977) at YouTube and notice the "shrinking" of spacetime toward "zero" vs. its "inflation" toward "infinity". If we use the inflating balloon analogy (p. **6**) from Sir Arthur Eddington, the *asymmetry* of time from the scale factor **a(t),** needed to "run" the Friedmann equations, comes from the *asymmetry* of space: unlike the numerical value of the so-called Planck length (read above), no numerical value, associated with some "limit" or "cutoff" at "infinitely large" chunk of spacetime, can exist. Thanks to the ***absence*** of such "dead end", the physical universe can expand ***indefinitely***. In a way, the situation resembles sea horizon, in the sense that there is always an apparent "dead end" of the sea *exactly* at the horizon, but you can never *actually* reach it and stop there, so you can "inflate" the sea and run toward the horizon at "infinity" ***indefinitely***. If we denote the infinitesimal displacement in space with **ds** (p. **18**), the largest, at *this* moment, cosmic structure in the universe will have "size" (**∞** – **ds**). Unlike the so-called Planck length, one cannot attribute any numerical value to the ***sliding*** cutoff located *exactly* at "infinity". This is the meaning of *asymmetry* of space. Twenty years ago, I could only suggest that the two **limits**, the fixed (Planck length) and the sliding one at (**∞** – **ds**), do not exist in the **4D** (Sic!) "surface" of the inflating balloon (p. **6**), as they are *eternally* residing at balloon's center (John 1:1).

We have two **4D** "directions" inside balloon's "surface" to look at the two **limits**, toward the Small or the *opposite* one toward the Large (watch 'Powers of Ten'), and hence we believe that balloon's center should be somehow "different" from the medium "outside" balloon's "surface", yet these "two" **limits** are in fact ***one*** single **pre-geometric** medium, which **wraps** the entire **4D** physical world (the tunnel above) *en bloc*. Twenty years after my proposal from October 1998, I can offer very specific details (p. **32**), but I am not available indefinitely. Detailed information about the topology of spacetime and quantum geometry has been available since 21 September 2008, and will be available until 10 GMT on 21 September 2018. Ten years are enough.

Yes, God (John 1:1) does exist. You cannot argue with 'maximal set theory' (pp. **29-30** above). If by 21 September 2018 no mathematician or physicist shows professional interest in the new hyperimaginary numbers, the Platonic theory of spacetime and quantum gravity and cosmology, I will irreversibly pull out **all** my research proposals launched since March 1994 (p. **9**), and let those "academic scholars" simmer in their own sauce: Matthew 7:6.

Personally, I don't need **unlimited** clean energy (p. **20**). I don't want to be "famous" and don't need money either. I'm fine.

D. Chakalov
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Today is 21 September 2018, none of the "academic scholars" signed to watch my lecture, and I am now *completely* disentangled from them. I am grateful to them for everything I learned, but they cut me off and I can do nothing about it. Sorry, no one can work alone.

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SPACETIME ENGINEERING

We can never know the future. It is 'open' to brand new events that are, at this moment, still in the realm of 'the unknown unknown'. Perhaps it is not entirely impossible that at some day in the distant future people will be interested in Platonic theory of spacetime and spacetime engineering. It is not "magic", of course. This brief note is aimed at explaining the basic principles of spacetime engineering from scratch. Just follow the links.

To understand the Platonic matrix (p. 5 above), check out ref. [14], Slides **10** and **11** in Quantum Spacetime, and the experiment on p. **2** in Hyperimaginary Numbers. There are no "jumps" in the human brain nor in the quantum world: the Platonic matrix encapsulates *the* quantum state, which is not physical reality but *potential* reality (*Res potentia*), "just in the middle between possibility and reality" (Werner Heisenberg). Again, the matrix is not physical reality, as Erwin Schrödinger realized in 1935. If you disregard the proposals by Plato and Heraclitus, you will leave no room for the Platonic matrix in our Weltbild: you will have only *physical* reality 'out there', and will have to speculate about some idiotic "dark energy" and "magic". If you are comfortable with talking bullshit, you may even be awarded Nobel Prize or become multi-millionaire by entertaining people. Point is, you will *never* learn the Law of Reversed Effort and spacetime engineering.

The matrix can only *unfold* toward you by its own **self-action**. We can only *invite* it by Love (1 John 4:8). It is exactly opposite to parapsychology. It cannot be misused, like nuclear energy. It cannot be used to kill people, no matter how much you hate them. It cannot be used for spying either. Why? Because it is *not* physical reality, like a hammer you can grab and hit a nail on its head. And if you don't understand the Platonic theory of spacetime, you will only have a hammer in your hand and every challenge will look to you like a nail. Example: global warming.

That's all folks. I cannot develop spacetime engineering all by myself. No one can work alone, as I wrote on 21 September 2018. The established "academic scholars" are good for nothing. Only kids have an open mind and I very much hope one day they will get involved. As Max Planck pointed out in 1936:

> An important scientific innovation rarely makes its way by gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out and that the growing generation is familiarized with the idea from the beginning: another instance of the fact that the future lies with youth.

D. Chakalov
Tuesday, 2 October 2018, 23:08 GMT