Time and Continuum: Zenon Manifold
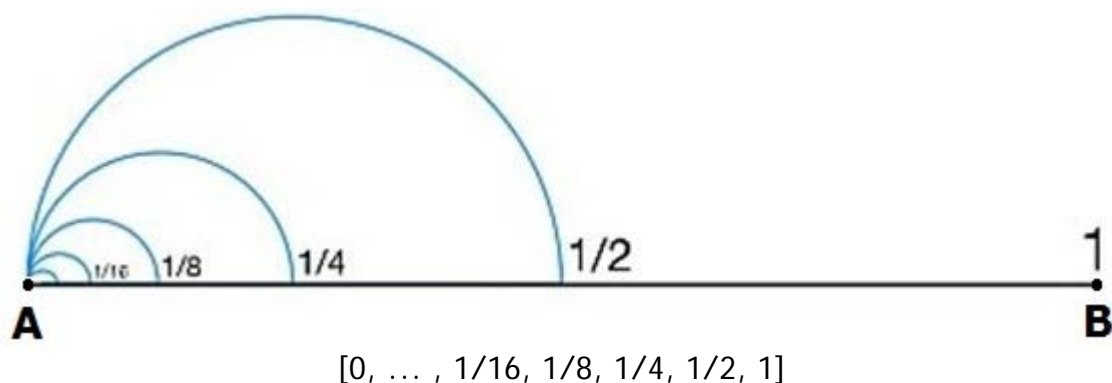
D. Chakalov[1]
chakalov.net

Abstract

Ensuing from first principles, I suggest pre-geometric theory of spacetime [1], in which the apex of light cone 'here and now' is not modeled with dimensionless point [2], but with non-trivial mathematical object along *null intervals*, endowed with brand new structure, topology and dynamics (contrary to Robert Geroch [3]), and defined on so-called Zenon manifold [4].

The full manuscript is available upon request.

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According to David Hilbert, an old French mathematician claimed that, if you suggest a new mathematical theory, it could not be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street. Let me try.

As told by Aristotle (*Physics* VI:9, 239b10), Zeno of Elea (490-430 BC) has formulated the famous dichotomy paradox: That which is in locomotion must arrive at the half-way stage before it arrives at the goal. In the drawing below, if we imagine **B** going back to **A**, then **B** will **stop** *only* at the ultimate limit **B≡A**, which denotes one single dimensionless point [2], and locomotion will be impossible. See Thompson's lamp paradox and **FI**, pp. 15-16 in [1].

[0, … , 1/16, 1/8, 1/4, 1/2, 1]

The only possible solution to the paradox above is to endow *every* point in [**AB**] with structure, topology and dynamics from the Heraclitean *flow of events* (p. 11 in [1]): replace **B≡A** with the elementary step of time AB depicted with Fig. **2c** at p. 14 in [4]. The speculations about spacetime continuum [5] and causality [3] are unacceptable, and I suggest a *perfect* continuum of spacetime points as 4D events called 'atoms of geometry' (Fig. 3 at p. 7 and p. 12 in [4]) defined on a brand new pre-geometric manifold, dubbed *Zenon manifold*. In one sentence, I introduce Heraclitean time (p. 11 in [1]) "inside" the geometric points AB (read above) to solve the problem of continuum [5]: all points from the number line (p. 39 in [1]) *follow* the Heraclitean time (Fig. **2c** at p. 14 in [4]) without any gaps whatsoever, not even by Gedankenexperiment. Now let's delve into details [8].

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[1] Email: dchakalov@gmail.com. No permanent address. Download the latest version (zenon.pdf) from this http URL.

References and Notes

1. D. Chakalov, *Platonic Theory of Spacetime*. 10 February 2019, 46 pp., at this http URL.

2. C. Stover and E. Weisstein. "Point." From MathWorld — A Wolfram Web Resource. http://mathworld.wolfram.com/Point.html

3. Robert Geroch, *General Relativity from A to B*, University of Chicago Press, 1978, p. 21. Robert Geroch and Gary Horowitz, *Global Structure of Spacetimes* (1979) at this http URL.

4. D. Chakalov, *Spacetime Engineering*. 2 April 2019, 16 pp., at this http URL.

5. John Baez, Struggles with the Continuum, arXiv:1609.01421v3, 2 January 2018, p. 2. Ioannis Raptis, arXiv:gr-qc/0110064v1, 15 October 2001; Sec. 2, (a)-(f) pathologies of the classical spacetime manifold.

6. D. Chakalov, *The Physics of Life*. 20 January 2019, 14 pp., at this http URL.

7. D. Chakalov, *Hyperimaginary Numbers*. 7 February 2018, 26 pp., at this http URL.

8. Notice that the back bone of Zenon manifold — the noumenal 'monad without windows' (read (**iii**) at p. 6 in [6]) — is not explicitly present in the drawing above. **It** is a brand new notion of 'zero' which, just like the "big bang", does *not* belong to the physical (or rather *physicalized*) spacetime (p. 3 in [1]). We may think of **it** (not "Him") as 'Platonic Universe as ONE' and suggest physical theology (pp. 29-30 in [1]) and spacetime engineering (pp. 1-3 and p. 13 in [4]; pp. 8-10 in [6]), and also correct many errors in present-day point-set topology, set theory, and number theory. The current mathematical presentation of the Continuum [5] is 'not even wrong': recall Zeno's dichotomy paradox above and read Erwin Schrödinger from 1935 (p. 2 in [6]) and Werner Heisenberg from 1958. The *intact* quantum world is perfect continuum, interpreted as Platonic *Res potentia* (dubbed John). It is still the first off mystery in Quantum Mechanics, known since 1911, thanks to Charles Wilson.

The Continuum is about Time: the elementary step of Heraclitean time <u>AB</u> 'here and now' (read above) is just the *interface* between irreversible past and Platonic potential future (Fig. 3 at p. 7 and Fig. **2c** at p. 14 in [4]). Think of <u>AB</u> as the ancient Ouroboros with two *dual* states (p. 3 in Penrose-Norris Diagram), or the god Janus looking simultaneously at the past and in the future. We need new Mathematics, not some "primordial standard clock" (Xingang Chen). For if some "oscillating" physical stuff behaves like "primordial clock" of the scale factor, it must be defined by another physical phenomenon, *ad infinitum*: Turtles all the way down. Which is why we need the Aristotelian Unmoved Mover endowed with self-action: *Der Geist bewegt die Materie* (Virgil, *The Aeneid*, VI, 727). Needless to say, the *physicalized* explications or "jackets" from the universal self-action cannot be traced to any physical "turtle" *whatsoever*, and many (otherwise smart) people decided to call them "dark" (p. 14 in [4]). But again, the self-acting John is Platonic reality "before" light, like Macavity. It has exactly *zero* chance to exist as physical reality (p. 17 in [1]).

As of today, nobody is interested. I keep exploring my "carrot" (p. 1 in [4]), it works like a charm, better than a Swiss watch — read the 'yellow button' story at p. 15 in [7]. Again, the full manuscript, entitled *Zenon Manifold*, is available upon request (Matthew 7:6).

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Last update: Easter 2019, 21:00 GMT

Addendum

The two-page manuscript above was submitted to arXiv.org on 24 Apr 2019 09:46:09 EST. One day later, on 25 April 2019, arXiv Moderation wrote: "Our moderators have determined that your submission is not of plausible interest for arXiv. As a result, we have removed your submission."

Let me show just one example of Platonic theory of spacetime, which, according to arXiv Moderation, "is not of plausible interest for arXiv." Recall the Catch 22 paradox from Escher's drawing hands at p. 3 in [4] and the crux of "GW astronomy", pp. 15-16 therein. Here's my conclusion (p. 12 therein):

> But there is no *direct* coupling of matter and geometry. Instead, matter is "coupled" to its *atemporal* (p. 3) Platonic state called *Res potentia* (John). The latter is being localized in the physical world (local mode of spacetime) as 'geometry', once-at-a-time. Thus, matter is acting *on itself* via its Platonic state (John) in the global mode of spacetime, thanks to which matter becomes *gravitalized* (Sic!) and acquires inertia due to the feedback (p. 11) from the entire Universe as ONE. In the same way the human brain is acting *on itself*. Only matter interacts with matter. Neither geometry (p. 4) nor parapsychological "ghosts" can.

There is no *direct* coupling of matter and geometry. As I explained previously (p. 3 in [6]),

> … the left-hand side contains an entirely different, neither quantum nor classical, animal. Many people consider "intuitively clear" to interpret this brand new object as 'pure geometry' (at the limit **B≡A**, read above – D.C.), like the grin of the Cheshire cat without the cat (p. 15), but here's the catch: "There is no spring or sink *everywhere* (emphasis mine – D.C.) in spacetime for matter (particles' plus electromagnetic field's) energy-momentum" (Zhaoyan Wu), which could be reserved exclusively for gravity, so that gravity could employ such "spring or sink" to interact with matter and fields, say, with a plastic bottle (p. 21) or with "a bead on a stick" (Richard Feynman). We face the same puzzle in the physics of the human brain: if the mind were able to interact with brain's tissue, then the mind will be a bona fide physical field. But how could geometric things interact with matter?

Read the first excerpt above. Again, geometric things do not *directly* interact with matter. They just can't. Matter is *always* localized in the irreversible past (Fig. 3 at p. 7 in [4]), whereas the gravitational energy is inherently *non-localizable* (MTW p. 467) and atemporal Platonic *Res potentia* (John) placed in the *potential* future, "just in the middle between possibility and reality" (Werner Heisenberg, p. 2 in [6]). According to GR textbooks, geometry acts on matter, telling it how to *move* (MTW p. 5), and hence the *gravitalized* matter becomes **self-acting**. Why? Because we cannot see 'the grin of the Cheshire cat without the cat'. We can see only <u>one</u> of Escher's drawing hands (p. 3 and p. 10 in [4]), placed in the right-hand side of Einstein's field equations, and it *cannot* obey the law of energy conservation (Hermann Bondi). If it could, gravity will become physical field. Thus, we need brand new notion of Time (read above) to unify GR and QM (Charles Wilson).

But this brand new approach to quantum gravity "is not of plausible interest for arXiv", said arXiv talebans.

So be it (Matthew 7:6).

Regarding quantum gravity and cosmology [8], look at the so-called evolution equation (Sec. 3 in CEN.pdf): at every consecutive instant <u>AB</u> 'here and now' (read above), the total energy of the *physicalized* universe is being nullified — once-at-a-time. The equation is still in symbolic form, pending the precise formulation of hyperimaginary numbers ($|w|^2 = 0$):

$$|w|^2 = |m|^2 + |m_i|^2$$

I also suggested spacetime engineering (pp. 1-3 and p. 13 in [4]; pp. 8-10 in [6]), with emphasis on particular type of natural healing known as Reiki. It is made of two Japanese words — Rei which means 'Higher Power' and Ki which denotes 'life force energy' (see 'Platonic Universe as ONE' [8] and pp. 11-12 in [6]). Reiki energy is not based on belief, faith, or suggestion. It cannot be guided by the practitioner, because it has its own innate wisdom to guide itself by its own self-action (read above): recall the Law of Reversed Effort (p. 9 and p. 38 in [1]). Everyone can master Reiki by learning (p. 43 therein), much like learning to juggle three balls in the air (p. 9 in [6]). All you need is one click away.

Happy Easter!

D. Chakalov
Easter 2019, 15:15 GMT

Questions and Answers

Q1. What do you mean by 'Platonic Universe as ONE' [8]?

A1: Firstly, the entire Universe as ONE is not comprehensible with our cognition, because it is not relational — it includes, by definition, *absolutely* everything. The two drawings below are misleading, as they show some background dark area "outside" the universe, with respect to which we can *think* of 'the boundary of the universe'. Secondly, the entire Universe as ONE is *atemporal* Platonic object, which acts as ultimate *cutoff* on the *physicalized* **4D** universe (email from 3 August 2018 at p. 26 in [1]). It (not "He") is *atemporal* Platonic object (dubbed "trunk" on p. 11 in [6]), like the state of Platonic photon "during" its flight, "after" it is emitted but "before" it is absorbed. In photon's reference frame, it does *not* age nor move at all, being at null interval (Kevin Brown).

Ditto to the Platonic Universe as ONE shown with red vertical line in Fig. **2c** at p. 14 in [4].

This **red** vertical line is the *atemporal* **radius** of the inflating balloon in Fig. 4 at p. 6 in [1]; read also p. 32 therein. It shows the *atemporal* "location" of the **matrix** (pp. 8-10 in [6]). Let me elaborate with the drawings below.

The dark "pizza" above shows the idea of 'expanding universe' as **2D** surface of the inflating balloon (the drawing at right), after Arthur Eddington. You <u>cannot</u> see here the **nullified** *atemporal* **radius** of the inflating balloon nor its omnipresent **center** at the Beginning (John 1:1): the ultimate limit **B≡A** shown at p. 1 above.

The two drawings above are misleading, because they "show" the entire physicalized 4D universe *en bloc*, "outside of time and outside of space" (Stéphane Durand, 2:15-2:23). We stay always *inside* 4D spacetime, along the horizontal line of instantaneous state of the *moving slit* below (1+1-D spacetime), from Stéphane Durand (source at this http URL).
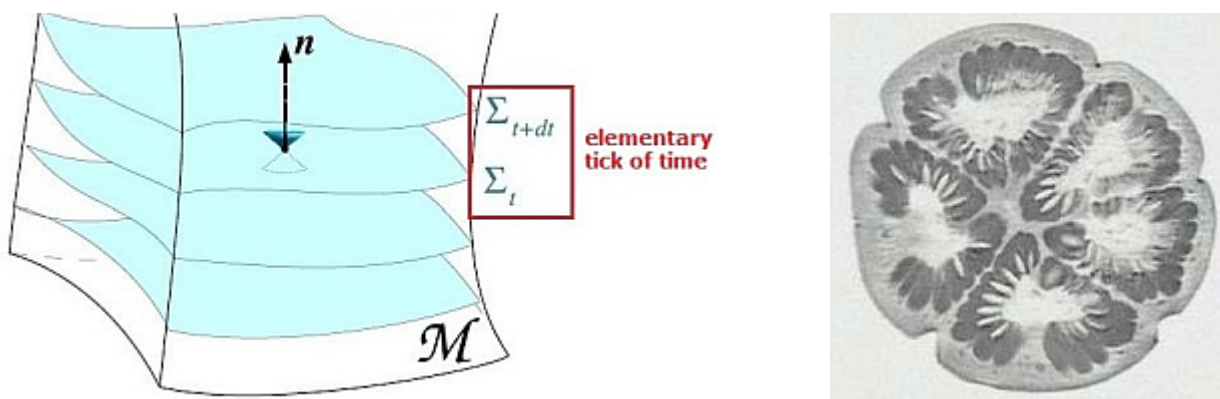

The horizontal line (left) of instantaneous state of the *moving slit* is **1**+1-D spacetime from which we produce **3**+1-D (local mode of) spacetime with *squared* (Wikipedia) local time. The **3D** slit itself is moving **up↑** following the global Heraclitean time (read above), shown with **red** vertical line in Fig. **2c** at p. 14 in [4] and marked with <u>AB</u> above. The **global** motion of **3D** slit **up↑** is *precisely* (Sic!) nullified — once-at-a-time, as recorded with your clock. This is the reason why we have a *perfect* 4D spacetime continuum (dubbed 'local mode of spacetime'), as explained also at p. 31 (conversation with Stavros) in [1]; see also Macavity.

Thus, the fundamental time asymmetry from the **3D** slit **up↑** above is *precisely* **nullified** in the *physicalized* 4D local mode of spacetime — we end up with two symmetric "future pointing" and "past pointing" vectors (Piotr Chrusciel), and "there is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes." (Robert Geroch in [3]). If this were true, you shouldn't be reading these lines, in the first place.

NB: To understand the **3D** slit above, imagine taking snapshots from a dark room with camera equipped with flash, and then *assembling* the snapshots to see the illuminated room as **3**+1-D movie reel (local mode of spacetime). There is no physical space nor time "between" the snapshots, and you will see a *perfect* spacetime continuum rendered *by the*

"speed" of light — the global Heraclitean time of the **3D** slit **up↑** above is "orthogonal" to the entire *physicalized* **4D** movie reel (local mode of spacetime), as it follows the **nullified** *atemporal* **radius** of the inflating balloon, from its **center B≡A** at the Beginning (John 1:1).

In numerical relativity, on the other hand, people interpret the sliding **3D** slit **up↑** above as the physical time read with a clock, by taking the stand of some unphysical meta observer "outside of time and outside of space" (Stéphane Durand). Such "splitting" of spacetime is not even wrong — the resulting picture of 'space + time' resembles the consecutive slices of a pumpkin, along the time of your wristwatch; click the animated (.gif) image below.
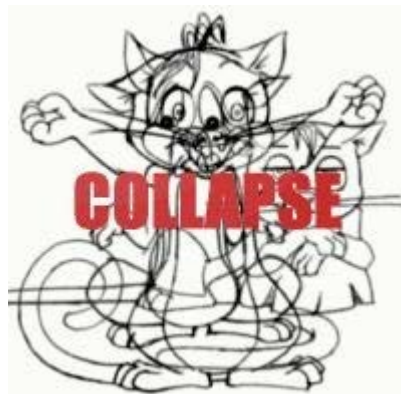

It is a grave error to present the cosmological time of the **3D** slit **up↑** (read above) with the time read with your clock. Read Slide **12** in Quantum Spacetime.

Q2: Are you suggesting Universal Mind, by quoting Vigril '*Der Geist bewegt die Materie*' (the Mind moves the matter)?

A2: No, I don't. Read about the doctrine of *trialism* at pp. 11-12 in [6] and pp. 29-30 in [1], and the excerpt above. Notice the "location" of *atemporal* Platonic **matrix** at p. 5 above. It is **self-acting** Platonic matrix (p. 3 above), neither mental (*Res cogitans*) nor physical (*Res extensa*) stuff. Read p. 9 in [6] and check out Slides **9** and **10** in Quantum Spacetime. To see a demonstration of the evolution equation (p. 4 above), watch closely Wong Yi Feng at this http URL. It's not "magic". Any sufficiently advanced technology is indistinguishable from magic (Arthur C. Clarke).

Please don't hesitate to submit your questions. If you wish to start from Mathematics, read p. 1 above and pp. 6-7 in [4]. If you decide to start from QM, read Erwin Schrödinger from 1935 at p. 2 in [6]. The *intact* Platonic quantum state (dubbed John) <u>cannot</u> have definite values, neither before nor after we measure it — quantum "superposition" of macroscopic classical states (see the cat states below) is an oxymoron (p. 14 in [6]).

There is no "collapse" in the quantum world (*ibid.*, p. 3). If you nevertheless prefer to follow the current QM textbooks, try to produce some "quantum time operator" from the trajectory of a single quantum particle, as demonstrated by Charles Wilson in 1911. Check out also Slides **6**, **7**, **8**, **9**, and **10** in Quantum Spacetime, to fully understand the *atemporal* Platonic matrix (pp. 8-10 in [6]).

If you prefer to start from GR, don't forget the **bundle** of inertia & gravitational rotation: read p. 13 in [6] and p. 46 in [1]. By comparison, we know from QM that electrons do not revolve about the nucleus, like a pea travelling in a circle, and the same tallies to the "classically not describable two-valuedness" known as quantum spin (Wolfgang Pauli). In current GR textbooks, the torsion is eliminated by hand from the outset, and nobody knows how spacetime geometry could possibly "move" matter (MTW p. 5) to produce continuous macroscopic gravitational rotation. Also, nobody has tried to explain how the gravitational "field" was created, so that mass "there" — the **whole universe** — could determine inertia "here" (John Wheeler). The solution is *very* simple and counterintuitive: read p. 3 above.

Finally, let me quote from the abstract of my first paper 'How to Bind Mind to Matter?' from January 1990 (source at this http URL): "the description of the bond "between" mind and matter and the description of the topology of spacetime are, in essence, one and the same problem." It took over twenty-three years to solve this immensely difficult problem, by suggesting a new theory of quantum gravity on 20 October 2013: read p. 3 above. Little did I know back in January 1990 that we need brand new mathematics and quantum gravity (read p. 4 above) to understand the physics of Life (p. 9 in [6]). To quote Erwin Schrödinger from 18 November 1950 (*ibid.*, p. 2), every *physical* fact "definitely either **is** or is **not**", whereas the *atemporal* Platonic quantum-gravitational *Res potentia* 'neither **is** nor is **not**'. It is a different kind of reality (dubbed John), "just in the middle between possibility and reality" (Werner Heisenberg): read p. 2 above.

As an illustration of *atemporal* Platonic *Res potentia*, recall John Wheeler's game of *Twenty Questions* (pp. 60-61 in gravity.pdf):

> There had been a plot not to agree on an object to be guessed, but that each person, when asked, must give a truthful answer concerning some real object that was in his mind, and which was consistent with all the answers that had gone before. With only one question left, John Wheeler guessed: "Is it a cloud?" The answer was "Yes**!**"

The final answer 'cloud' was correlated with all previous answers, but it could not been physicalized from/by the Platonic idea of 'cloud *per se*' until the final question. But if you say 'cloud', you will not "collapse" the Platonic idea of 'cloud *per se*', which keeps its invariant *meaning*: try the experiment with your brain at p. 2 in [7]. Now just replace 'meaning' with *atemporal* Platonic matrix and read Slides **9** and **10** in Quantum Spacetime, and p. 13 in [4]. Every *physicalized* 'jacket' occupies one single "point" in the number line. All you need is one click away.

As to the physicalized, cloud-like manifestation of gravity as inertia-and-gravitational rotation (read above and p. 35 in [1]), the *Bondi news*, which determines the energy flux of gravitational radiation, cannot produce holomovement in the cosmos — read p. 3 above. You need the ultimate **cutoff** on the physical universe (**Q1** at p. 4 above) to define the positivity mass conjecture — you cannot "install" GW mirrors at null-and-spacelike infinity.

To sum up, I offer three proposals (**P**) relevant to Mathematics and mathematical physics:

P1. New pre-geometric manifold, called Zenon manifold (p. 1 above), in which all geometric points are emergent *physicalized* points ('jackets' or 'clouds'), whereas their common Platonic source does not belong [8] to its set of emergent *physicalized* geometric points. I also suggest corrections (explained in the full paper) to point-set topology, set theory, and number theory, and new numbers called hyperimaginary numbers ($|w|^2 = 0$).

P2. Every geometric point has internal structure "along" the three types of *null intervals* ($c^2t^2 = r^2$, see Wikipedia), such that these dynamic points *follow* the global Heraclitean time without any gaps whatsoever (p. 1 above), thanks to which we end up with *perfect* **4D** spacetime continuum (local mode of spacetime) made by 'jackets' or 'clouds' (p. 7 above).

P3. The global and non-relational Heraclitean time, depicted with the motion of **3D** slit **up↑** (p. 5 above), is unobservable due to the "speed" of light: p. 31 in [1] and Macavity. For if **it** were *physically* observable, we will face 'turtles all the way down' (p. 2 above).
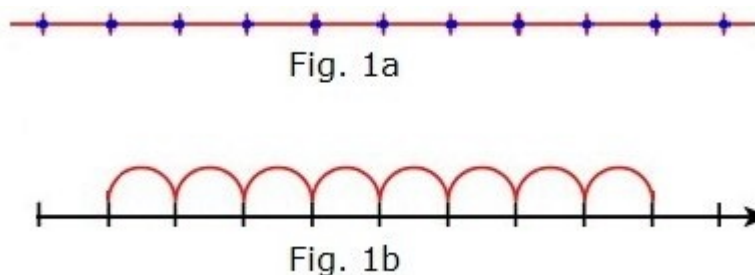
Corollaries (**C**):

C1. The so-called Russell's paradox, revealed in 1899 by Ernst Zermelo, is not applicable to Zenon manifold — the unphysical Platonic world (p. 11 in [1]), which can organize any uncountable set of elements "into a whole" (*Zusammenfassung zu einem Ganzen*, Georg Cantor), does not belong to any element of its own set. The unphysical Platonic world (read [8]) is the **UN**speakable (p. 2 in [7]) manifestation of 'absolute zero' (not 'zero of *something*', p. 30 in [1]), known as 'the monad without windows' (Leibniz).

C2. Atemporal Platonic Universe as ONE (p. 4 above) and Platonic reality endowed with self-action (p. 3 above), presented with so-called global mode of spacetime spanned "along" null intervals [1]: spacetime engineering [4]. The *atemporal* Platonic world (John) is the common source of (**i**) its *physicalizable* eigenstates (e.g., 'cloud', p. 7 above) and in the case of gravity (**ii**) its *physicalizable* (non-tensorial) and *gravitalized* energy, momentum, and angular momentum (p. 7 above). Tensors are applicable only to a *physical* fact that "definitely either *is* or is *not*" (Erwin Schrödinger): no tensors in quantum gravity. For if geometry were *physical* fact, it could instruct matter/energy "how to move" only by some *physical* 'total field' (*Gesamtfeld*, Albert Einstein at p. 12 in [4]), which simply does not exist. There is no *direct* coupling of geometry to electromagnetic field in the first place, as we know after the unsuccessful efforts by Gunnar Nordstrøm in 1914: p. 3 above.

C3. To those who are only curious about how the Platonic **matrix** works (p. 7 above): recall the probability for emergence of life. As Fred Hoyle remarked (p. 9 in [6]), the random emergence of even the simplest cell matches the likelihood that "a tornado sweeping through a junk-yard might assemble a Boeing 747 from the materials therein." Or recall the collision deep below the surface of the Atlantic Ocean of two nuclear submarines in February 2009 (p. 18 in [7]) — the chance of such correlation is perhaps much higher than the chance of successful correlation of your 100 billion neurons and 100+ trillion synapses right above your neck (ensuing from your prenatal brain), so that you can read these lines. This is the Platonic **matrix** in action. The list goes on and on.

To demonstrate the Platonic **matrix**, read the 'dark room' analogy at p. 5 above and recall how you create light in a dark room with a light bulb, which emits photons with rate, say, 1.8×10^{20} photons per second (Slide **9** in Quantum Spacetime), depicted with blue dots in Fig. 1a below. All photons (blue dots) are *identical* 'jackets' or 'clouds' (p. 7 above) cast by the Platonic **matrix** of 'photon *per se*', depicted in Fig. 1b below.

Notice that EM radiation in Fig. 1a below employs *background* spacetime continuum, like the 1+1-D slit **up↑** at p. 5 above, thanks to which we estimate the *rate* of app. 1.8 x 10^{20} photons per second, whereas the 'dark room' (p. 5 above) is the Platonic **matrix** depicted in Fig. 1b below. The latter is *precisely* nullified ($|w|^2 = 0$) in the *physicalized* spacetime in Fig. 1a: read **P1** above.

Fig. 1a

Fig. 1b

The first off challenge to canonical quantum gravity and the problem of time is to suggest some "quantized" spacetime which, unlike EM radiation on *background* spacetime at Fig. 1a, does not have *any* background whatsoever. The problem resembles painting a picture without any canvas (p. 17 in [1]). The "canvas" might be 'something else' (C.J. Isham and J. Butterfield) that could only be hidden]between[the "quanta" of gravitational "field".

But how to describe some entity, which must not exist as physical reality? We have similar situation in QFT, as the question of how virtual particles exist "before" they show up and "after" they go back to the quantum vacuum is quietly swept under the carpet, despite the fact that its precursor is known since 1935, thanks to Erwin Schrödinger (p. 2 in [6]). The only possible solution, in my opinion, is to employ the Platonic **matrix**: read p. 3 above. As Bernhard Riemann stated in June 1854, "Either the reality which underlies space must form a discrete manifoldness, or we must seek the ground of its metric relations outside it, in binding forces which act upon it." Just replace 'outside it' with the Platonic **matrix**. What happens locally, in the infinitesimal neighborhood of every geometric point, depends on the Platonic state of the entire Universe as ONE, and *vice versa* (**C2** at p. 8 above).

If you disagree, check out the alternative approach with "gravitons" suggested by Nobel Laureate Kip Thorne, and try his experiment aimed at creating "gravitons" at p. 16 in [4]. Read also p. 25 (last) in viXra:1712.0017vA. Sad but true.

Again, anything you were unable to understand will be entirely my fault. Should you have questions, please don't hesitate to contact me by email.

But if you are not interested in the origin of Time and Continuum, as demonstrated with Zeno's paradox of motion (p. 1 above) — no problem (Matthew 7:6). Have a beer instead. 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
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