Gravitational energy: The wegtransformierbar elephant

Look at the drawing below: what do you see?

Obviously, this is an elephant walking on tight rope, only it fell off at the very instant you looked at it, just like Eliot's cat Macavity. Which is why we can only *think* about "geodesic" (H. Ohanian and L. Szabados); details in *The Atemporal Platonic World*. Some explanation is obviously needed.

The 'elephant' here stands for the energy of gravity, that is, the energy from geometry: the grin on the face of Cheshire cat, but *without* the cat, as observed by Alice.

"Space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve." J.A. Wheeler in *Gravitation*, p. 5.

Which goes first? Space acting on matter (telling it how to move), or matter acting on space (telling it how to "curve")? Wrong question!

See Escher's 'drawing hands'. Their *atemporal* negotiation is ***already*** **re**-completed at every instant from the metric time $\boldsymbol{\tau}$.

Thanks to the equivalence principle in GR (MTW p. 467), the influence of gravity can *always* be gauged away at any point. To quote A. Afriat and E. Caccese: "Vanishing is an important criterion: a complex whose components are *wegtransformierbar* cannot be physically real – one whose components all vanish cannot 'coincide' with one whose components don't."

But the two components don't have to "coincide". Instead, "both fluxes cancel, and thus leading to a vanishing 'flux', i.e., $t_{\mu\nu} = 0$." (M. Montesinos). How could this happen? Because, to quote again M. Montesinos, "there is a **balance** (emphasis mine – D.C.) between the 'content' of energy and momentum densities and stress associated with the matter fields (…) and the 'content' of energy and momentum densities and stress associated with the gravitational field (…)

$$\longrightarrow\longrightarrow\longrightarrow\longrightarrow\longrightarrow\longrightarrow$$
$$\longleftarrow\longleftarrow\longleftarrow\longleftarrow\longleftarrow\longleftarrow \qquad (23)$$

… in a precise form, such that both fluxes cancel, and thus leading to a vanishing 'flux', i.e., $t_{\mu\nu} = 0$. Once again, the vanishing property of $t_{\mu\nu}$ for the system of gravity coupled to matter fields is just a reflection of the fact that the background metric is dynamical. More precisely, $t_{\mu\nu} = 0$ tells us that the 'reaction' of the dynamical background metric is such that it just cancels the effect of 'flux' associated with the matter fields. It is impossible (and makes no sense) to have a locally non-vanishing 'flux' in this situation. If this were the case, there would be no explanation for the origin of that **non**-vanishing 'flux' (emphasis mine – D.C.). Moreover, that hypothetic non-vanishing 'flux' would define privileged observers associated with it (the ether would come back!)."

But what if the 'balance' (cf. Eq. 23 above) at $t_{\mu\nu} = 0$ is valid only for **individual** points from the (geodesic) rope above? Can we think of **non**-vanishing 'flux' over the entire 'rope'? Let me reproduce the illustration with a football at p. 5 in *The Atemporal Platonic World*.

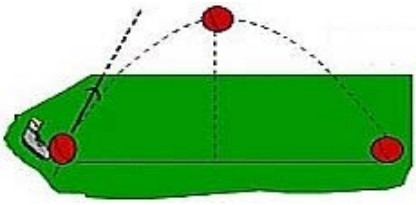


Fig. A

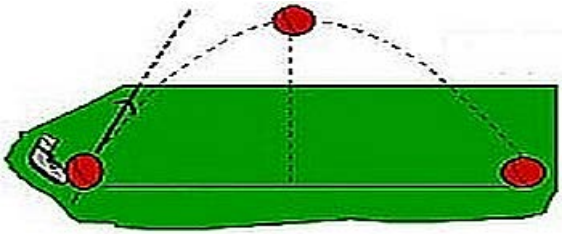


Fig. B

If the football is ***gravitalized***, it can acquire "energy and momentum from the gravitational field" (H. Ohanian) and "the *intangible* energy of the gravitational field" (H. Bondi) will become *perfectly* 'tangible'. For example, the football in Fig. A can ***gain*** energy-momentum, as shown in Fig. B, or lose it. Moreover, if we kick the football straight up in the air, we will expect at some point to stop raising upward and go down, and perhaps hit your head, like Newton's apple falling from an apple tree. But if the football is ***gravitalized***, it may continue to fly up in the air with ***acceleration***, as if it were propelled by some mythical "dark energy" (p. 19 in Zenon, and Anomalous Aerial Vehicle at p. 16 in BCCP).

Briefly, the 'balance' (cf. Eq. 23 above) at $t_{\mu\nu} = 0$ is valid only for **individual** 'jackets' from the rope above, because at each and every **individual** point/jacket the *total* energy is exactly **balanced** – **nullified** and hence **"**conserved**"** – in the so-called 'evolution equation' (p. 4 in Zenon and p. 3 in BCCP). The quantum-gravitational 'John' is *wegtransformierbar* **Platonic** reality: at any consecutive instant from the *observable* metric time τ (C. Rovelli), the *intangible* energy of the gravitational field (H. Bondi) is *already* (Sic!) converted into *perfectly* tangible, localizable ***positive*** energy in the *right-hand* side of EFE, and the **Platonic** state of gravity, dubbed 'John', is *completely* **re-nullified** – once-at-a-time τ, as read with a clock. This is 'the new normal' ***gravitalized*** state at which "the gravitational field delivers no energy or momentum to the nongravitational matter" ***anymore*** (H. Ohanian). Will do it again, at the *next* instant τ viz. at the **next** 'new normal' ***gravitalized*** state. The general rule is very simple: the **Platonic** world is presented as 'John' in Schrödinger's cat and with '**zero**' in Macavity cat. In symbolic terms, **1 + 0 = 1**: the probabilities for observing John's *jackets* sum up *exactly* to **1**, whereas the chance to observe 'John' itself is *exactly* **zero**, as with the *wegtransformierbar* elephant above.

The evolution equation (Eq. 1 at p. 3) models the ability of Nature to unleash *unlimited* positive mass in the physical world by ***tweaking*** the cancellation mechanism producing positive mass, ranging from "positive energy density of about 6×10^{-10} joules per cubic meter" (J. Baez), or even *much* less, to 3×10^{47} joules of energy in less than a minute, in gamma-ray bursts (GRBs). The upper bound (if any) on positive energy release is unknown, as nobody knows how much energy was needed to create the universe at The Beginning (John 1:1).

Point is, forget about 'energy conservation', even in a mundane geodesic (H. Ohanian). You cannot even dream of "energy conservation" to ban the monopole & dipole radiation, if any. Forget about GWs. Read p. 24 in BCCP, p. 13 in Zenon, and p. 6 (last) in *How to Bind Matter to Matter*.

More about 'negative mass' from G. Horowitz. Watch the explanation of the balance (*not* conservation) of energy by P. Steinhardt. Notice my proposal to harness the "anomalous" gravitational rotation in Fig. **E** at p. 18 in BCCP, and read p. 28 (last) therein.

One last word about "the *intangible* energy of the gravitational field" (H. Bondi). It is not physical reality placed in the *right-hand* side of EFE, but *atemporal* **Platonic** reality (see Escher's drawing hands), quietly residing "just in the middle between possibility and reality" (W. Heisenberg). The *atemporal* negotiations between matter and geometry, depicted with Escher's 'drawing hands' and the Cheshire cat above, cannot be presented with tensors. We need brand new, ***not-yet***-squared quantum-gravitational waves: the ***gravitalized*** 'cat' is acting on **itself** ***via*** its own *atemporal* **Platonic** ***not-yet***-squared state. Geometry alone cannot act on matter: the bare *grin* of the cat, *without* the cat, cannot have "gravitational stress-energy tensor" (E. Curiel). Matter can only act on **itself**, like the human brain.

Thus, the *intangible* **Platonic** world is ***not-yet***-squared (recall the squared spacetime interval $\Delta \mathbf{s}^2$) yet *physicalizable* reality. It is available to be squared and "collapsed" into positive energy density in the physical world, by dropping there its 4D 'jackets' endowed with metric, once-at-a-time, as read with a clock: see below Fig. **3** in *How to Bind Matter to Matter*.

The idea of "negative mass" appears in physics textbooks only because the Heraclitean *flow* of 4D events is *completely* **nullified** in these textbooks: there can be no ***asymmetry*** between the *irreversible* past and the *potential* future in the squared invariant spacetime interval. Subsequently, there is no explanation of baryon asymmetry and the theory of baryogenesis sounds like a fairy tale (if not worse, like "anthropic principle"). The "negative mass" cannot be ***completely*** banned with *effective* "quantum inequalities" or "weak energy condition". For if you invoke some timelike vector field or 'time-orientability', you're applying "magic".

How come nothing goes wrong? To quote A.D. Helfer, "why do not perturbations (which are always present) send the field cascading through these negative-energy states, with a corresponding release of positive-energy radiation? It is a matter of common experience that such effects do not occur, or at least not often, and therefore there must be some mechanism restricting the production of negative energy densities, their magnitudes, durations, or interactions with other matter. (...) The present results suggest that any attempt to understand the consequences of negative energy densities for gravity (Hawking evaporation; effect on singularity theorems, area theorem, positivity of Bondi and ADM energies) must take into account quantum measurement issues."

You can't argue with **facts**: read p. 6 in BCCP. As of today, however, the experts in GR are dead silent. Nobody knows how to unite the three types of mass — positive, negative, and imaginary — into ***not-yet***-squared quantum-gravitational waves of *atemporal* **Platonic** world. The so-called evolution equation is still in symbolic form, pending the precise formulation of hyperimaginary numbers ($\mathbf{|w|^2 = 0}$):

$$\mathbf{|w|^2 = |m|^2 + |m_i|^2} \qquad \text{(Eq. 1)}.$$

I still don't know how the hypothetical ***not-yet***-squared quantum-gravitational waves with *hypercomplex* phase could ***cancel*** each other, to cast their 4D remnant with positive energy. If the negative component $|\mathbf{m}_i|^2$ in Eq. 1 and its positive counterpart $|\mathbf{m}|^2$ can "runaway" (Robert Nemiroff) to create **self-acting** quantum-gravitational systems and living organisms, perhaps we can understand and explore the energy density of the vacuum. Qui vivra verra.

Now, my theory of the *atemporal* **Platonic** world as the ***origin*** of gravitational energy is falsifiable, and I will offer a prediction which, if confirmed, will ruin the entire theory. I will refer to the crucial statement about the "dynamics" (if any) of gravity in GR textbooks: the mutual negotiation of 'space and mater' (MTW p. 5). It can be determined at ***one*** instant only (pp. 14-15 in Zenon). If the gravitational energy could be defined at *two* pointwise instants, **m** and **n**, fixing the beginning and the end of an invariant spacetime interval [**m**, **n**], gravity will become a brand new ***physical*** field endowed with its own "gravitational stress-energy tensor" that will ***influence*** the stress-energy tensor of the football in Fig. A and Fig. B above.

Look at the *wegtransformierbar* elephant above. It is impossible *in principle* to observe the origin of gravity along a ***finite*** interval from the geodesic above. Denote two instants from the *metric* time $\boldsymbol{\tau}$ (C. Rovelli) with $\boldsymbol{\tau}_\mathbf{m}$ and $\boldsymbol{\tau}_\mathbf{n}$, $\mathbf{n} > \mathbf{m}$, for example, $\boldsymbol{\tau}_\mathbf{n} - \boldsymbol{\tau}_\mathbf{m} = 1$ sec, as read with your clock. Can you present a case in which your clock will read all (infinitely many) *pointwise* instants ("elephants") from the *metric* time $\boldsymbol{\tau}$ within 1 sec? If you can show such case (read C.G. Torre), the *atemporal* **Platonic** world will have nothing to do with gravity, and I will eat my hat. Promise. However, gravity will become *physical* field, like the EM field, the metric will be ***frozen*** (not dynamical), and will define some brand new "background" spacetime of the non-linear negotiation of the Cheshire cat and its *faceless* grin above, and the non-linear bi-directional determination of Escher's drawing hands.

Let me reproduce and explain Fig. 3 at p. 3 in *How to Bind Matter to Matter*. The *atemporal* **non**-squared **Platonic** world, called '**It**', is quietly residing "just in the middle between possibility and reality" (W. Heisenberg), depicted with the '**bridge**' in Fig. 3 below. **It** obeys the postulate of locality, magnified here with infinitesimal **dt** = 1cm as 'quantum of action' in the so-called 'geodesic' (K. Brown), and also shows the *quantization* of spacetime. The latter is ***perfect*** continuum of 4D events, because no *physical* stuff can be inserted "inside" the infinitesimal **dt** – only the **non**-squared *wegtransformierbar* **Platonic** world '**It**'. Notice that the '**bridge**' below is interpreted as pre-geometric and non-differentiable **Platonic** "glue" made by the *entire* Universe as **ONE**.

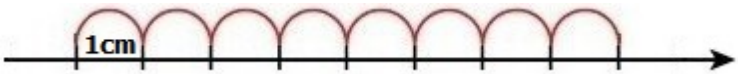


Fig. 3

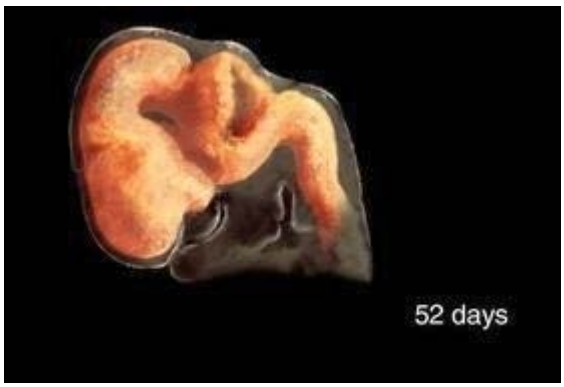
NB: Forget tensors (p. 19 in Zenon). We need the *atemporal* **Platonic** world of **non**-squared quantum-gravitational **waves** and their fleeting "eigenstates". We need new Mathematics.

Recall Albert Einstein: "I want to know God's thoughts – the rest are mere details." Replace 'God's thoughts' with the *atemporal* **Platonic** world called '**It**', and keep in mind that the chance to observe '**It**' is *exactly* **zero**, as explained with the general rule at p. 2 above. This rule is crucially important, because '*the* quantum state' dubbed John is *wegtransformierbar* as well: read Erwin Schrödinger at p. 6 in BCCP. Last but not least, the wegtransformierbar *atemporal* **Platonic** world '**It**' is *conditio sine qua non* for all living organisms, such as the **self-acting** human brain. Without '**It**', you will be left with two idiotic options: either the brain above your neck is some "super computer" or a chunk of gray matter haunted by some parapsychological "ghost" (p. 1 in *How to Bind Matter to Matter*). The choice is yours.

To avoid misunderstandings, consider an experiment with the 'intangible' (H. Bondi) energy of your **self-acting** brain, demonstrating non-verbal processing of mental images (A. Paivio). Imagine two digital clocks, A and B. Clock A shows 10:45 and Clock B shows 13:25. Convert them to analog clocks, and "look" closely at their mental images: which *angle* between the short and the long hands is greater? In Clock A or in Clock B? To deliver the answer, your brain must do **work**. Not your mind or 'stream of consciousness'. Your ***brain*** does the job. In GR parlance, you may claim that, before the experiment, your brain was in some 'free falling' state along a 'geodesic', but to deliver the answer your brain had to "deviate" from its "geodesic equation" by producing **work** on **itself**, by *perfectly* 'tangible' (H. Bondi) energy. No, you brain does not become "curved". Not a bit. It is bootstrapped and EPR-like (H. Stapp) correlated by its own *atemporal* **Platonic** state — not by some "super computer" or by some parapsychological "ghost". And yes, your *atemporal* **Platonic** state has 'mental correlate' or qualia, called mind, stream of consciousness, volition, etc. Read *The Doctrine of Trialism*.

To cut the long story short, notice that the Heraclitean *arrow* of events (Fig. 3 above) is based on two conditions: necessary condition ('change **in** space' as local or coordinate time) and ***sufficient*** condition ('change **of** space' pertaining to the global **Platonic** time), explained at pp. 3-4 in *How to Bind Matter to Matter*. The two conditions are blended like a **Platonic** "hand" in 4D "glove" (pp. 5-6 in *Über die Substanz von Raum und Zeit*). The **Platonic** "hand" must be *wegtransformierbar* as well, or else there could be some ***physical*** origin of the Heraclitean *arrow* of events viz. some *physical* phenomenon at absolute rest, being the 'engine' of the *arrow* of events. Instead, I suggest the *atemporal* **Platonic** world called '**It**', and ***localizable*** quantum-gravitational 'jackets', like the **Platonic** "hand" in 4D "glove".

If you are interested in life sciences, look at your prenatal brain below and keep in mind that soon it will grow with the rate of about 15 million nerve cells per hour, and later your brain will create roughly 1,000 trillion synaptic connections, so that now you can read and think. The situation with our 'very early universe' is very similar, because its initial conditions and well-posed boundary value conditions ***could not*** (Sic!) exist in the 'very early' "glove" below, and certainly not earlier at the Planck epoch, just 10^{-43} sec after The Beginning at time **zero** (John 1:1). Simple, isn't it?



As Fred Hoyle remarked (**C3** at p. 8 in Zenon), 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.

For the record: I suggested '*atemporal* quantum reality' 33 years ago, on 5 February 1987, ensuing from the interpretation of QM by Henry Margenau from 1954, the transactional interpretation (TIQM), and the first off mystery in QM from 1911, thanks to Charles Wilson. Read p. 4 in *Penrose-Norris Diagram*, as well as R. Penrose and S. Weinberg.

Watch 'Spacetime Engineering 101' (app. 22 min, password protected), from 15 January 2020. To obtain the password, follow the instructions at pp. 2-3 in *Spacetime Engineering*. To understand how to harness the *atemporal* **Platonic** world '**It**', see the metaphor below.

You only have to swing the carrot (*potential* **future**) toward your desired destination, and the donkey will carry you and the cart there. The principal question is how to develop feedback from the *atemporal* **Platonic** "carrot" and get empowered by '**It**': follow the Law of Reversed Effort. There is no ***physical*** interaction between you and the *wegtransformierbar* '**It'**— you'll only notice that your ability to perform **self-action** has *increased*. It's **not** like Baron Münchhausen. Newton's 3rd law is **not** valid here. Simple, no?

The main talking points are explained at pp. 4-5 in *The Atemporal Platonic World*. Take '**It**' or leave it.

D. Chakalov
27 January 2020
Last update: 5 February 2020, 14:50 GMT

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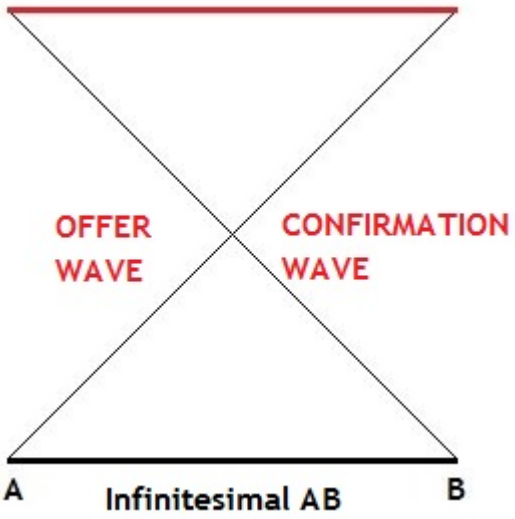
Questions and Answers

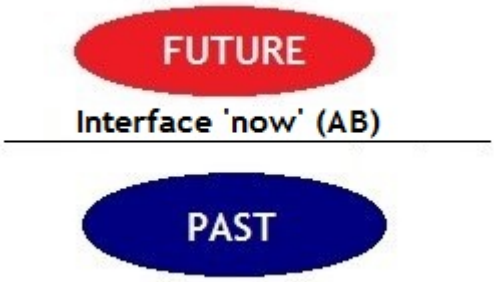
Q1. Your theory is very dense and I can't understand why I would need it.
A1. Read about juggling three balls at p. 9 in *The Physics of Life*.

Q2. What do you mean by "causal field"?
A2. The hypothetical *causal field* is defined over the spectrum of all 'potential states' in the future, which *may* or *may not* be actualized. They represent the *flexibility* of your "carrot". For example, if you have a glass of scotch with an ice cube in it, the chance to see the ice cube outside the glass is zero. Why? Because the ice cube is **fixed** macroscopic object: it either '*is*' or '*is not*' in the glass. Not so in QM: see the quantum tunneling effect at p. 4 in *Stellar Nucleosynthesis*. Physicists talk only about probabilities, but notice that the chance of your prenatal brain to evolve into its current state is FAPP zero, or at least *far less* than the chance for two nuclear submarines to collide in the ocean, as it happened in February 2009. You may call this phenomenon 'synchronicity', but this is just a label. We need to explain the *atemporal* **Platonic** world '**It**'. If we were dealing with *physical* reality, it should be located somewhere in the light cone, and we would have to deal with "tachyons". Bad idea. I spent over two years studying tachyons, from 1984 to 1986, and finally realized that we need to dig much deeper: *atemporal* quantum reality, as suggested on 5 February 1987. The *atemporal* **Platonic** world does not live ***anywhere*** in the light cone: every 4D event 'here and now' is immersed into the causal field spanned along the hyperimaginary axis **W** (p. 27 in BCCP) viz. along the hyperimaginary **radius** of the 'inflating balloon' in cosmology (p. 21 in BCCP). This **radius**, however, is always ***re*-nullified** (p. 2 above) in the *squared* spacetime interval, which leads to *physicalized* 4+**0**-D spacetime with local (coordinate) time only (p. 5 above).

Q3: How do you work with your "spacetime engineering"?
A3: I can tell you how I work with the *atemporal* **Platonic** "carrot", as explained previously. My grandfather was down-to-earth electrical engineer, not some "spiritual" person, but he always carried a small pendulum in his pocket, to "see" (as he put it) whether some food or medicine is good for him. He taught me dowsing with a pendulum when I was 17 (over 50 years ago), starting with a simple statement "*Alles ist Schwingung*" (everything is vibration). Everything in the world, he said, has particular "vibration", so if you manage to "tune" to it, your pendulum can amplify the "vibration" and you will see whether it is good or bad for you. Well, that's not good enough: read **A1** above. I'll suggest another illustration of the "carrot" above. Recall how you can tune your guitar by ears: how do you know the *exact* "meaning" of **E A D G B E**? You operate only with the *quale* from the vibrating string, whereas the neural correlates of **E A D G B E** in your brain are anything but 'standard', as in German DIN, say. Therefore, I suggest you can 'tune' to the *atemporal* **Platonic** 'standard', like you tune your guitar, only this 'standard' is the **UN**speakable "carrot": try the experiment with your brain at p. 22 in Zenon. Here we enter Jung's *kollektive Unbewusste*, which is a very murky area to every engineer, so let's go back to the theory of relativity: how Nature *calibrates* every rod and clock with its 'light-travel time' to match the "correct" **1m** and **1sec** (read p. **3** here). It is *very* tricky to work with the **UN**speakable light-travel time: read **A1** on p. 22 in BCCP.

Q4. Where is the proof of your theory of **Platonic** time?
A4. Let me step back for a moment. In 1772, on the occasion of the fall of meteorites, the French Academy of Sciences adopted a resolution categorically rejecting such ridiculous claims. The obvious reason had been that stones cannot fall from the sky, simply because "the fall of stones from the heavens is physically impossible" (A. Lavoisier). Likewise, when you look at the sky, you could never imagine that the space *itself* could possibly "move", in any way whatever, and you may also reject my "ridiculous" claims. To your question: I don't have the *proof* of 'change **of** space' pertaining to the *atemporal* **Platonic** world (p. 5 above). I will have to move "outside" spacetime to "look" at the inflating balloon (pp. 20-21 in BCCP) *en bloc*, to prove/disprove that its point-like initial state — The Beginning at time **zero** — was indeed God (John 1:1) residing "inside" every **AB** instant 'here and now' (Luke 17:21) below, called 'atom of geometry'. The latter has non-trivial topology, structure, and dynamics along the Heraclitean time as 'change **of** space': everything changes and nothing remains still, you cannot step twice into the same stream (p. 11 in *Platonic Theory of Spacetime*).





AB shows the infinitesimal **dt** in Fig. 3 above and the apex 'here and now' in the light cone, at which the *atemporal* negotiation of Escher's drawing hands is ***already*** completed — once-at-a-time, as read with a clock.

This is the *atom of geometry*. The idea is very old — see the Dragon metaphor on p. 3 in *Penrose-Norris Diagram*. Notice also the evolution equation (still in symbolic form) above.

Q5: Why are you banging your head against a wall?
A5: Climate change – read about the Rossby Waves here. We need unlimited clean energy, and spacetime engineering is *the* only option we have to reduce CO_2 emissions by 7.6 per cent *each and every year* from 2020 to 2030. If we fail now, by 2025 (Sic!) the cut needed will steepen to 15.5 per cent *each year*, which is **absurd**, plain and simple. Read about the UN Environment Program Emissions Gap Report from 26 November 2019 here. My task is very tough. I need support to test the proposal to utilize the "anomalous" gravitational rotation, explained in Fig. **E** at p. 18 in BCCP.

There are a few more questions, but I decline to answer them. Here's why.

People like to think with stereotypes, like taxi drivers do. There is nothing wrong with that, but the stereotype they apply on me is false. I don't seek recognition by '15 minutes of fame' and don't entertain people, like those street magicians. If you are interested in foundations of Mathematics and quantum gravity, or in combating climate change, read above.

NB: Time is running out! Read p. 28 in BCCP and p. 8 (last) in *Spacetime Engineering 101*.

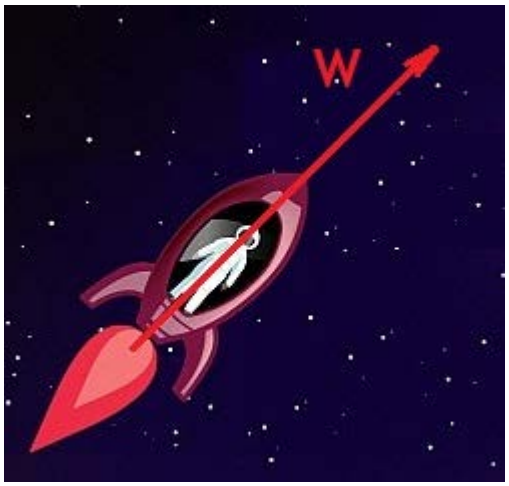
D. Chakalov
11 February 2020, 12:58 GMT

Addendum

There is a nice French saying: *une hirondelle ne fait pas le printemps* (literally, one swallow doesn't make spring). In my case, I can modify it as follows:

Une hirondelle ne fait pas le printemps.
Deux hirondelles ne fait pas le printemps non plus.
Mais cinq hirondelles … well, that's a whole new ball game!

I have so far 5 (five) confirmations of spacetime engineering. That's a whole new ball game. Not "discovery", as Eq. 1 above is still in symbolic form. It describes the creation of *positive* matter since The Beginning at time **zero** (read above), and stands as an alternative to what Brian Schmidt calls "runaway process". We still have no idea how spacetime applies "brakes" to an accelerated body (John Wheeler) *and* induces gravitational rotation (Richard Feynman). But at least we know what we do *not* know: the vector **W** in the drawing below.



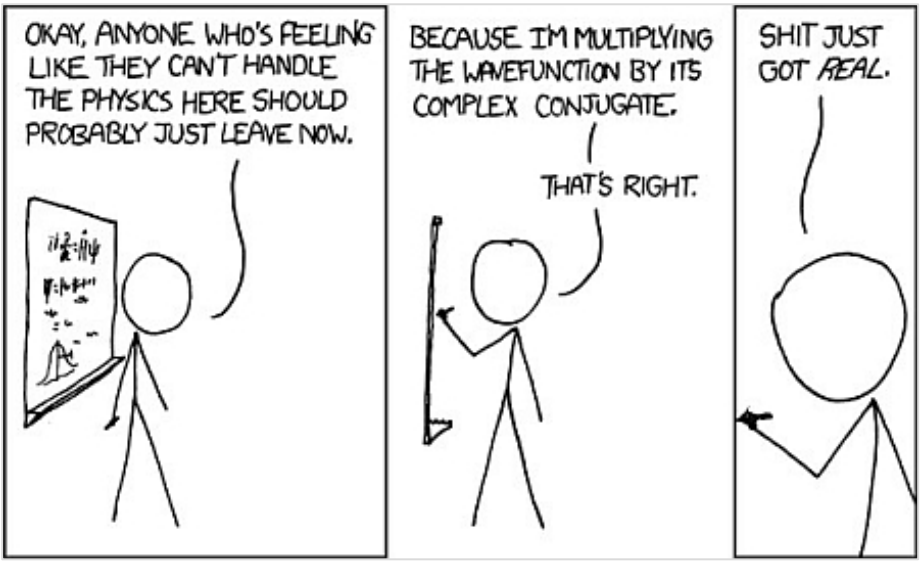
See Fig. **A** and Fig. **B** on p. 21 in BCCP.

Eq. 1 above transforms the (hyperimaginary) axis **W** into the vector "erected" at light-like zero interval **AB**. This vector is ***re*-nullified** in the *squared* spacetime interval, and points to the hypothetical *causal field*: read **A2** above. The vector **W** also refers to the *sufficient* condition for spacetime: 'change **of** space' in the Heraclitean *arrow* of events (p. 5 above). The light cone does **not** show the vector **W**, and we don't have a clue what causes the alteration of the ***rate*** of time along **W**, called in GR 'gravitation'. No, it is not "curvature".

The *topology* of spacetime induces 'rotation'. Read p. 4 in *The Atemporal Platonic World*.

The space rocket above (adapted from Markus Pössel) purports to show Einstein's hypothesis about the equality of inertial and gravitational mass, which carries many unsolved problems, as explained by John L. Synge and Hermann Bondi. The non-tensorial puzzle (p. 19 in Zenon) is still unsolved. Perhaps it will be easier to understand by comparing GR to QM.

The drawing below (see p. 4 in *Spacetime Engineering*) shows the *absence* of physical reality (ice cube, see **A2** above) in QM textbooks: read Erwin Schrödinger from 1935 at p. 6 in BCCP.



GR textbooks, on the other hand, claim that the gravitational energy is *not* 'physical reality', because it can always be gauged away (MTW p. 467) within the infinitesimal neighborhood AB (read above) of any spacetime point. In both cases, 'shit *just* got real'. You just 'shut up and calculate' (N. David Mermin).

Well, I don't accept "magic" nor those "non-tensorial" jabberwockies in GR (p. 19 in Zenon). Read *The Atemporal Platonic World*. My theory of gravity is based on the ***rate*** of time along **W** (recall the space rocket above). Again, there is no "curvature" here. Will be happy to explain how the global 'change **of** space' (p. 5 above) is embedded in the Lorentz factor. It may sound too speculative (p. 2 above), but it works flawlessly, better than a Swiss watch. Needless to say, I don't invoke non-tensorial Christoffel symbols (J. Bloomfield): see the '**bridge**' in Fig. **3** above. There is no "mystery matter" (Brian Schmidt) nor "dark energy".

To those interested in spacetime engineering: read my note at p. **3** here. The textbook definition of topological manifold as topological space, which locally (Sic!) ***resembles*** real **n**-dimensional (Sic!) space, is amended as follows: locally – yes, in the infinitesimal AB in the drawings at p. 7 above, but 'real **n**-dimensional space' – no, because the topology of the *physical* world is 4+**0**; read **A2** above. Mathematicians may suggest all sorts of purely abstract 'manifolds', as an intellectual exercise driven by sheer imagination, but I'm not interested. The topology of the Universe as **ONE** is still unknown: "God alone is wholly without body" (Gottfried Wilhelm von Leibniz, *The Monadology*, §72). See the drawings at p. 22 in BCCP. If you disagree, I will leave you in the company of R. Penrose and S. Weinberg.

Let's wrap it up: how will you explain the *wegtransformierbar* elephant above? For it ***must*** disappear from the light cone (recall Eliot's cat Macavity), just like the wave function in QM ***must*** disappear upon its "collapse". We also perform gravitational "collapse" by hand, by switching to the so-called 'freely falling coordinates' (H. Ohanian), leaving the *physicalizable* "jackets" in the physical 4+**0**-D world, in line with the general rule explained at p. 2 above.

To refute my theory of gravitational energy, read p. 4 above. There is no energy-momentum current for gravity. There is no such animal. There is no ‘gravitational time’ parameter in GR textbooks. There is no ‘quantum time’ parameter (Charles Wilson) in QM textbooks either. Read my endnote here. If you disagree – or agree – with my theory of gravitational energy, consider writing a paper and submit it to arXiv.org. Once I see it, will respond professionally. Promise.

D. Chakalov
11 February 2020
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Über Die Gravitationsfeldrelativitätstheorie

Recall the postulated *alteration* of the rate of Heraclitean time along **W** at p. 8 above. It does not create any “curvature”. Let me offer a brief illustration (read the synopsis here).

Consider a car (object with non-zero positive rest mass) that can run with different velocities (distance travelled per second) with respect to the road at rest. Call these three velocities ‘**a**ttractive’, ‘**n**eutral’, and ‘**r**epulsive’, and denote them as $\mathbf{V_a}$, $\mathbf{V_n}$, and $\mathbf{V_r}$. All of them refer to the ***rate*** of Heraclitean time along **W** (p. 8 above), whereas **W** itself does *not* have metric.

Let us examine three temporal intervals with different durations, 20*****, 40*****, and 80*****, depicted below with lines built by “frames” denoted with (*****), like in a movie reel (p. 21 in BCCP).

$\mathbf{V_a}$: ********************

$\mathbf{V_n}$: **

$\mathbf{V_r}$: **

Think of the three temporal lines above as movie reels recorded with *variable* rates (frames ***** per second, FPS), and set $\mathbf{V_a}$ = 20 FPS, $\mathbf{V_n}$ = 40 FPS, and $\mathbf{V_r}$ = 80 FPS. Relative to $\mathbf{V_a}$ (20 FPS), $\mathbf{V_n}$ (40 FPS) will run twice faster; relative to $\mathbf{V_n}$ (40 FPS), $\mathbf{V_r}$ (80 FPS) will also run twice faster. In all cases, the car with *variable* FPS will pass **1s** Heraclitean time as ‘change **of** space’ (p. 5) along **W** (p. 8). This is how *variable rates* (FPS) can assemble *different* spacetime intervals for *the same invariant* **1s** Heraclitean time by ***inflating*** the *physical* frames (*****) per second.

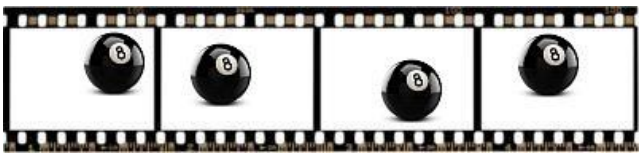
The car with ‘neutral’ $\mathbf{V_n}$ corresponds to *weightless* objects with **zero** g-force: recall the astronauts on the International Space Station (ISS). Their clocks run *faster* ($\mathbf{V_n > V_a}$) than the clocks on the surface of Earth (clocks on the surface are lagging 0.007 seconds behind for every six months), and we had to adjust the clocks to have GPS navigation (R.W. Pogge).

What could happen if the astronauts on ISS inflate *their* rate of Heraclitean time along **W** to match $\mathbf{V_r}$? Perhaps they will fly by *repulsive* gravity, like an Anomalous Aerial Vehicle (p. 16 in BCCP). ***Relative to*** (Sic!) an observer on Earth, they will now travel with $\mathbf{V_r}$ = 80*****/s (80 FPS) for **1s**, but in ***their*** reference frame ***they*** may travel with $\mathbf{V_r}$ = 20*****/s (20 FPS), because of <u>the same</u> invariant **1s**. They only have to inflate ***their*** “number” of frames ***** per second, and the overall duration will be, again, the “correct” **1s**. Likewise, if our guests fly with *their* $\mathbf{V_r}$ = 5m/s, while *their* 5m matches *our* 5km on Earth, ***we*** will see *their* speed as 5000m/s, and will be terribly intrigued by their insane acceleration and mind-boggling sharp turns. But in *their* reference frame *they* fly with *their* 5m/s, which won’t break their AAV. If they choose to fly with 0.8**c** (Lorentz factor $\gamma = 1.667$), their clocks will ‘tick’ (R.W. Pogge) *much* slower than those on ISS above. Yet all clocks, theirs and ours, will read the “correct” *invariant* **1s**: there is no absolute time (Newton) to determine which clock is “correct”. They all are.

In this framework, the "speed" of photons in vacuum (the dark space around the rocket at p. 8 above), denoted with **c** (zero proper mass, $\mathbf{M^2 = 0}$), is *atemporal*: **0 *** (FPS) per null interval ($\mathbf{x^2 = (\pm ct)^2}$).

To avoid misunderstandings, I will offer another illustration of the hypothetical phenomenon illustrated in the drawings above. Watch the lightning strike in slow motion, uploaded at YouTube on July 27, 2011. It has been recorded with the *rate* of over 5000 FPS, so that 1s from a clip, recorded usually with 30 FPS, was ***inflated*** to 3 min. That is, 180 times.

The lightning strike with duration **1s** was recorded with 5400 FPS, but projected with 30 FPS. If we use 30 FPS but with 180x *inflated* frames, we will ***shrink*** the original 5400 FPS to 30 FPS (5400/180=30) and will see it as a miniscule (**1s**) flash of light. Of course, the case of the lightning strike is trivial, because all frames in recording with 5400 FPS and with 30 FPS have exactly the same ***finite*** size separated by a strip, as in a movie reel.



In the *gravitational* theory of relativity (Die *Gravitationsfeldrelativitätstheorie*) there are no vertical strips that do *not* belong to the geometric points of the spacetime *continuum*. No background movie screen ***at rest***, to project these images on it. No background 'road at rest' (p. 10) either. There are no "true length" or "true duration": **1s** and **3 min** will be "correct". This is how the squared invariant spacetime intervals ($\Delta \mathbf{s^2}$) can ***shrink*** and ***inflate*** (pp. 5-6 in Zenon). Relative to *what*? ***Not*** to some unphysical "ideal" observer, which has bird's eye view at the entire 'space rocket' and its dark background at *absolute* rest (p. 8). We are "inside" the rocket and *cannot* see its "background" nor "engine" called Unmoved Mover. If we could "see" **It** (not "Him"), the theory of relativity will be demolished by *absolute* spacetime.

We cannot fly like AAVs, perhaps because we still do not know how Nature "calibrates" the light-travel time: see Fig. 9 in *Spacetime Physics* by E.F. Taylor and J.A. Wheeler, and my note at p. **3** here. Read also about the theory of Relative Scale (**RS**) spacetime at p. 20 in BCCP. Look at the three drawings above: they all represent '1 **RS** second'. If you look at Fig. **3** above, you may interpret it as a finite segment with length 8cm from the number line, but how many points (Euclid) build up *exactly* 8cm? The set of points, which can assemble *exactly* 8cm, has non-denumerable cardinality. There is no number we could attach to the cardinality of this set, because the "number" of geometric points – *not* the frames (*****) from the movie reels above – is uncountably infinite (Kurt Gödel).

Thus, I believe the infinitesimal region of spacetime does not have *finite* size, like a pixel from digital image, separated from the neighboring pixels by 'something else'. The notions of 'small' and 'large' are indeed correct, yet they are *not* absolute (p. 20 in BCCP), as you may wrongly infer by taking the stand of unphysical "ideal" observer and looking at the 'orders of length', from 10^{-35}m to 10^{24}m, in Wikipedia. Absolute objects (p. 8) are *not* physical.

It's all relative, as uncle Albert used to say. Today I commemorate his 141st birthday by introducing the equation of *Gravitationsfeldrelativitätstheorie*

RS = **1** (Eq. 2).

R (from **r**ate) denotes the rate of the Heraclitean 'time flow' **W** (p. 8), and **S** (from **s**ize) denotes the ***relative*** size of the squared invariant spacetime intervals (Δ **s**^{2}). For example, if **R** = $\mathbf{V_a}$ (20 FPS), then **S** = 20 and **RS** = **1**, namely, the invariant '1 **RS** second'. Ditto to **R** = $\mathbf{V_r}$ (80 FPS), **S** = 80 and **RS** = **1**, that is, the invariant '1 **RS** second', which is "relative" to ***itself***.

The alternative to the gravitational theory of relativity (*Gravitationsfeldrelativitätstheorie*) is the established GR, which begins with a "massive body" (Wikipedia) that *somehow*, and for some unknown reason, would create particular "influence" (Sic!) in 4D spacetime. (And then "the Christoffel symbols play the role of the gravitational force field and the metric tensor plays the role of the gravitational potential", etc.)

Hold on: what kind of "influence" (p. 4) is that? In the first place, this "influence" doesn't look like electromagnetism. All we know for sure is that gravity can alter the *rate* of time, as demonstrated, e.g., in the case of GPS navigation and time dilation. But what is '*rate* of time'? One second per second? One meter per meter? And with respect to *what*? See again the drawing at p. 8 and read my note at p. **3** here. We need to start from first principles.

Now, I stated previously that my theory may sound speculative (**A4**), yet it works flawlessly, better than a Swiss watch (p. 9). All you need is a brain, to ***work*** with mental images: try the experiment from Allan Paivio at p. 5 above, and recall **A1** (p. 6). Once you get the qualia from '1 **RS** second', you will experience it as 'part of your body', and you're done. Only our perception of the *passage of time* might occasionally "slow down" a bit, like watching the lightning strike in slow motion above, and you will experience your subjective world (p. 5) with much greater clarity, by zooming at every detail of it, your mind included. Nevertheless, spacetime engineering is still a very subtle art, and we need to know much more to produce large-scale gravitational rotation (p. 22 in BCCP) and combat climate change (p. 28 in BCCP).

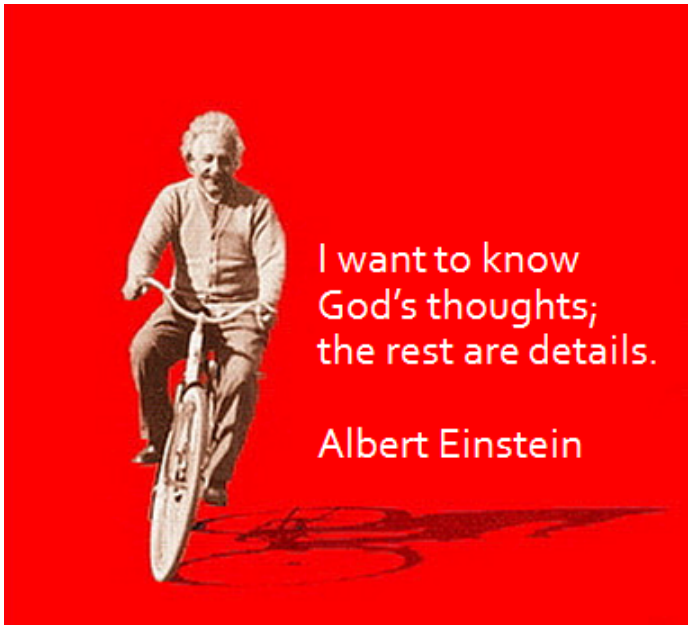
First and above all, we need Mathematics to reveal the hyperimaginary numbers and spell out the evolution equation (Eq. 1 on p. 3), in line with the 'general rule' (p. 2): the spacetime of the physical world has 4+**0**-dimensions (p. 9). The proper understanding of spacetime (Fig. 3) and the *flexibility* of the invariant spacetime interval (Eq. 2) are essential prerequisites for learning spacetime engineering (p. 2). All you need is a thinking brain (p. 5 and **A1** at p. 6).

People automatically dismiss spacetime engineering, without providing even a shred of evidence against my theory of gravitational energy (p. 9), by just calling it "impossible": read p. 4 in *The three cats in quantum gravity*. If gravity was *physical* field like electromagnetism, then of course we must produce ***work*** to counteract gravity, as in maglev trains. It is quite frustrating to hear people "rejecting" my theory just by saying that it "contradicts" what was *rejected* in it from the outset. We only try to replace the idea of spacetime "curvature" with putative effects of Time (p. 8). Is QM is wrong because it rejects the old Rutherford model?

To wrap up, the Gravitational Theory of Relativity (GTR) treats the physical world as retarded light endowed with inertia (Dennis Sciama), and photons with zero proper mass ($\mathbf{M^2 = 0}$) and non-relational "speed" denoted with **c**. The *physicalized* 4+**0**-D world is made of quantum-gravitational "jackets" cast from/by the *atemporal* **Platonic** world (p. 8). The latter (called **It**, not "He") has *exactly* **zero** chance ($\mathbf{|w|^2 = 0}$) to be observed *anywhere* on the light cone. **It** has been camouflaged as some fictitious "space devoid of matter" (p. 6 in *The Atemporal Platonic World*) or as quantum "waves" in Hilbert space (Charles Wilson). The explanation of gravitational rotation (Richard Feynman) and inertia (John Wheeler) are intertwined: p. 46 in *Platonic Theory of Spacetime*. See my proposal in Fig. **E** at p. 18 in BCCP and p. 28 therein.

As of today, my note on GTR (p. 10) is essentially incomplete (read the synopsis here). It may (hopefully) outline the path toward an alternative interpretation of the "influence" (p. 12) of gravity, and the path toward unification of QM and GR with their common *atemporal* waves (p. 7). We are still many years away from understanding how spacetime applies instantaneous "brakes" to an accelerated body, and why. This paper is intended to offer just a hint to what Albert Einstein called *Gesamtfeld*:

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



Happy 141rd birthday, Albert!
You were a good man and
outstanding physicist.

May God enwrap you in His thoughts and
give you endless joy and happiness.

D. Chakalov
14 March 2020, 10:30 GMT