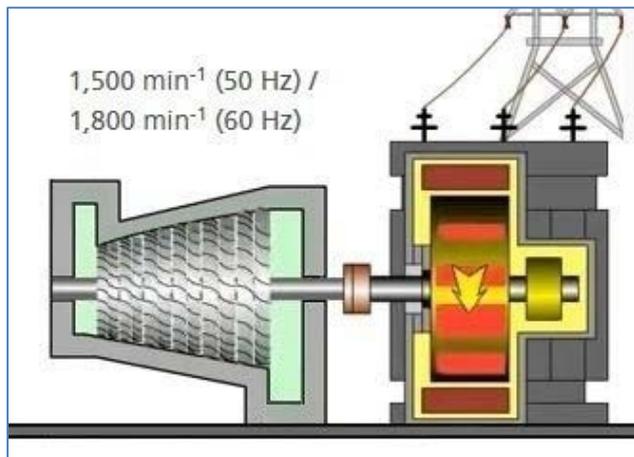


## Experimental Tests of Spacetime Engineering

By the end of October 2025, I plan to complete two large-scale experiments with [spacetime engineering](#). The 'proof of concept' will be shown at *GRAVITY 21* (p. 13 in [GR\\_textbook.pdf](#)). No, I do not entertain people with "magic" ([ibid.](#), p. 24). It is all about [the origin of gravity](#).

### 1. Gravitational rotation

As acknowledged on p. 8 in [facts.pdf](#), the theory still cannot be verified with experiment or observation. As of today, 20 October 2020, I still cannot rotate a *heavy* chunk of metal with gravitational rotation (p. 18 in [BCCP](#)).



My proposal for producing unlimited electricity is based on gravitational rotation (p. 4 in [The Physics of Life](#)): spin the [steam turbine rotors](#) in all [power plants](#) with spacetime engineering (p. 6 in [Gravitational Energy](#)). No water supply, heat, or hazardous [nuclear fuel](#) will be needed. It shouldn't be a problem to rotate a chunk of metal – gravity can *effortlessly* rotate a [whole galaxy en bloc](#). This is the way to solve the task for unlimited clean energy and save our planet from the upcoming [climate crisis](#) – read p. 28 in [BCCP](#). We must not use [nuclear fission](#) nor [coal](#).

### 2. REIM

REIM is an acronym from 'reversible elimination of inertial mass'. This second test requires the support from various institutions. We make **two** round trips with a private jet over a distance of at least 500 km: the pilot, two inspectors, and the author of these lines. We also need two high precision portable atomic clocks ([\\$1500](#) each), which will be synchronized before flying. One of the synchronized portable atomic clocks will be placed in the jet. After the first round trip with average speed of, say, 500 km/h, the two inspectors will compare the atomic clock in the jet with the one kept on the ground, to verify that no measurable [time dilation](#) has occurred. Then we make the second round trip of 500 km, and once the jet reaches its maximum height at app. [41 000 ft](#) or 12.5 km, the pilot will let me fly the jet. I will make it a REIM drive and fly until we come back and approach the airfield, at which point I will let the pilot safely land the jet, and the inspectors will compare the atomic clock in the jet with the one on the ground. If the [time dilation](#) has occurred, I will consider the theory confirmed (p. 10 in [wegtransformierbar.pdf](#))<sup>‡</sup>.

Perhaps one could also test the theory by observation, as recorded with video cameras installed on the cockpit window, facing forward. If the REIM drive (the jet with idling engines) is flying in our RS reference frame with 5 km/h and with RS factor  $\Omega = 1000$ , an observer on the ground will measure our speed as 5000 km/h<sup>‡</sup>. It cannot be ruled out that the video cameras in the cockpit will record an anomalous behavior of 3D space in front of the jet, meaning that the space itself will look like moving toward the REIM drive at rest. It's all relative, as uncle Albert used to say (pp. 20-21 in [BCCP](#)).

As always, I strictly follow the 'two rules for success' by Roger H. Lincoln:

Rule #1. Never tell everything you know.

D. Chakalov

20 October 2020, 13:50 GMT

‡ As an illustration of the [hypothetical RS effect](#) predicted at p. 10 in [wegtransformierbar.pdf](#), think of two cars, called Alice and Bob, traveling with speed  $A$  and  $B$  over the same *spacetime* interval ([Wikipedia](#)) of 5 km. If  $A = B = 5$  km/h, the two cars will trespass 5 km for 1 hour. Now, separate the cars in their RS reference frames (pp. 20-21 in [BCCP](#)) and “inflate” the metric for the second car  $B$  by RS factor  $\Omega = 1000$ , *relative to*  $\Omega = 1$  in the RS frame of the first car  $A$ : 1 m to Bob will match 1 km to Alice. Bob with RS speed  $B$  will trespass or “consume” 5 km for 1000x less time, because in his RS frame the *rate* (Sic!) of the *global* Time is 1000x greater. Let me explain the *grid* of Relative Scale (RS) spacetime, created and [calibrated](#) by the phenomenon we call ‘global Heraclitean Time’. **It** (not “He”) is at [absolute rest](#) and cannot be detected due to the invariant “speed” of light (pp. 19-20 in [GR\\_textbook.pdf](#)). **It** also **pulls up** ([Slide 2](#)) the physical 4D universe and makes it “fly” ([John A. Wheeler](#)) in the global Time ([Slide 1](#)).

Think of the *rate* of Time as ‘speed’ (read [here](#)), so if this *rate* is 1000x greater for Bob in his RS frame, his proper time to trespass 5 km will be 1000x smaller – *relative to* Alice. Which means that Bob with RS speed  $B$  will “consume” 1000x less time, *relative to* Alice: not 1 hour (3600 s) but 3.6 s, and people may interpret it as [time dilation](#). In the case of REIM [above](#), we have RS factor  $\Omega = 1$  for Alice with speed  $A$ , and RS factor  $\Omega = 1000$  for Bob with speed  $B$ . They “fly” (read p. 4) over the *grid* of Relative Scale (RS) spacetime with the invariant “speed” of light ([Slide 4](#)) in which 1 RS meter equals  $3.33564 \times 10^{-9}$  s of *light-travel time* ([E.F. Taylor and J.A. Wheeler](#)). And the *rate* of the *light-travel time* (p. 11 in [synopsis.pdf](#)) makes the *grid flexible*.



With the exception of [photons](#), the global Time, pictured with the vertical arrow (left), [does not stop](#). All physical objects with non-zero positive mass “fly” with the invariant “speed” of light but with different *rates* of Time, which makes the *grid flexible*.



NB: In all RS frames, 1 RS meter equals  $3.33564 \times 10^{-9}$  s of proper *light-travel time* pertaining to the *invariant* “speed” of light. The only difference is the *rate* of global Heraclitean Time, **embedded** in the *light-travel time*: **It** (not “He”) *renders* 1000 RS meters in Alice’s RS frame as 1 RS meter in Bob’s RS frame. Hence the global *unobservable* Heraclitean Time ([Slide 2](#)) makes the invariant *spacetime* interval ([Wikipedia](#)) viz. the RS meter *infinitely flexible* (read below). Not the local *metric* time  $\tau$  ([C. Rovelli](#)). There is no “true” time ([J. Butterfield and C.J. Isham](#)).

Briefly, if the REIM drive [above](#) will fly with 1000x greater speed, the atomic clocks, after the *second* round trip (read [above](#)), may show [time dilation](#). By how much? Well, stay tuned. With current theoretical physics, you may speculate that the REIM drive [above](#) will fly with “dark energy”. Wrong. Forget “mystery matter”. The RS spacetime is far more interesting, because it denounces the *absolute* (hence *unacceptable*) length scale ([Wikipedia](#)): what we call Large and Small (watch our Alice in [Powers of Ten](#)) is a *relative* phenomenon. At macroscopic RS frame, at the length scale of tables and chairs, we raise a 3D “axis”  $r$  with opposite 3D directions, with *positive* RS factor  $\Omega$  toward the Large and *negative* RS factor  $\Omega$  toward the Small. If we instruct Bob to “travel” along the 3D “axis”  $r$  with increasing *positive* values of RS factor  $\Omega$ , his RS size will reach the size of a [galaxy](#) and beyond, and Bob will look “inflated” to Alice in her RS frame. Subsequently, the light emitted by Bob will be [redshifted](#) due to the [Hubble Flow](#). Yet in Bob’s RS frame, his RS size will remain *unchanged*. Only his RS meter will be “inflated” – relative only to Alice. Not to Bob. Ditto to the inverse case of Bob “diving” into the Small by increasing *negative* values of RS factor  $\Omega$ . This is the blueprint for quantum gravity (20 October 2013).

Is there a “right” etalon of meter-and-second? No (p. 11 in [synopsis.pdf](#)). All is relative. It is impossible to detect the Aether at “[absolute rest](#)”, relative to which the photon (see [above](#)) would be at rest. It is impossible to detect the banks of the [Heraclitean river](#), which would be also at rest. It is impossible to define the *flow* of global Heraclitean Time as “liters per second” and determine the *rate* of Heraclitean Time. **It** (not “He”) is simply **non**-relational. We cannot *in principle* calculate some “intrinsic” flow of Time in the way we calculate [Gaussian curvature](#), because the fundamental *asymmetry* of Time is *completely* eliminated in our 4D spacetime: the invariant spacetime interval  $\Delta s^2$  is *always* squared ([Robert Wald](#)). We introduce [Killing fields](#) only by hand, just like we introduce the “obvious” [energy conditions](#). The list goes on and on. Point is, the *atemporal Platonic* world at “[absolute rest](#)” does exist, yet **It cannot be observed**. Otherwise the Theory of Relativity will be demolished. Let me go back to the origin of gravity.

The global phenomenon in RS spacetime (pp. 20-27 in [BCCP](#)), creating the Large and the Small, creates gravity *locally*: it both “shrinks” the spacetime metric to produce local gravitational attraction and “inflates” the spacetime metric to produce local gravitational repulsion, until the two tug-of-war manifestations of gravity reach dynamic equilibrium ([Daniel Pomarède](#)). This is how gravity ([W.G. Unruh](#)) works in the cosmos, by bootstrapping the entire physical universe like a holistic [brain](#). For more, get the facts in [facts.pdf](#). Don’t let [Kip Thorne](#) fool you again.

Finally, recall (read [above](#)) that the ‘proof of concept’ will be presented at the international conference *GRAVITY 21* (p. 13 and pp. 25-26 in [GR\\_textbook.pdf](#)). Before making any further steps, I need to have my theory discussed by [many professional mathematicians and theoretical physicists](#). How much ‘[energy from geometry](#)’ ( $\lambda$ ) is needed to propel **up**↑ the ‘[elevator](#)’ at rest ([Slide 2](#))? What (topological?) phenomenon is responsible for the ubiquitous [inertia & rotation](#) ([Richard Feynman](#))? What if the [physical world](#) is just ‘retarded light’, given the interpretation of “photon” (p. 9 in [GR\\_textbook.pdf](#)) and “[negative mass](#)” ([Hermann Bondi](#))? How about an alternative theory of fixing spacetime “boundaries”, which can and will obliterate the Platonic theory of spacetime (p. 10 in [GR\\_textbook.pdf](#))? Do we need new [Mathematics](#)? And above all, what if I am wrong? This is why the ‘[proof of concept](#)’ is indeed crucial. Nobody can work alone.

For comparison, consider the alternative ‘proof of concept’ with [Wendelstein 7-X](#). According to [Wikipedia](#), “it has been anticipated to achieve operations of up to approximately 30 minutes of continuous plasma discharge in 2021.” So far at least **€1.06 billion** ([ibid.](#)) have been invested. The other ‘proof of concept’ with [ITER](#), expected to be finalized in 2025, will cost *much* more: **€13 billion** (p. 13 in [facts.pdf](#)).

How much will cost an international conference on gravity, such as [GRAVITY 21](#)? As a bonus, we might learn something – anything – about the *origin* of gravity ([W.G. Unruh](#)) and gravitational rotation ([Richard Feynman](#)). It’s a bundle. Forget “[curvature](#)” (p. 40 in [GR\\_textbook.pdf](#)). We need to show the global negotiation ([M.C. Escher](#)) of the *entire* Universe ([Dennis Sciama](#)) and every infinitesimal point ‘here and now’ ([Fig. B](#)) – [think globally act locally](#) – thanks to which every infinitesimal 4D event ([Slide 2](#)) is endowed with inertia ([John A. Wheeler](#)) and rotation. Then we can proceed to [quantum cosmology](#) and physical theology (p. 12 in [synopsis.pdf](#)): the *pregeometric* Universe as **ONE** wraps the physical world (p. 2) at RS factors  $\Omega = +\infty$  and  $\Omega = -\infty$ . In the doctrine of *trialism* (p. 25 in [BCCP](#)), we have two *complementary* explications of Nature. Let’s be honest: we know nothing about the *origin* of gravity (p. 3) and gravitational rotation. As Sir Arthur Eddington put it, “*something unknown is doing we don’t know what*”. All theories of gravity, [mine included](#), sound like a [Jabberwocky](#):

’Twas brillig, and the slithy toves  
 Did gyre and gimble in the wabe:  
 All mimsy were the borogoves,  
 And the mome raths outgrabe.

## Frequently Raised Objections

O1. You may not “inflate” or “deflate” the invariant *spacetime* interval (Wikipedia)<sup>‡</sup>.

A1. Read p. 2: I disagree with the *absolute* (hence *unacceptable*) length scale (Wikipedia). It could be ‘absolute’ iff there were some elementary spacetime domain with *finite* size  $L$ , which could be *the* elementary ‘building block’ at all length scales (*ibid.*), resembling the tiles in Fig. A. But there is no metric at *Planck scale*. See instead the ‘atom of geometry’ (Fig. B).



Fig. A

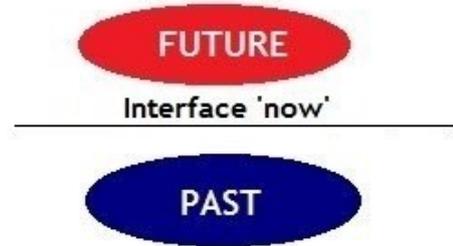


Fig. B

I will be happy to explain the *atom of geometry* in details (p. 9 and p. 27 in [GR\\_textbook.pdf](#)). Unlike the tiles in Fig. A, the atoms of geometry in Fig. B are *not* countable (Wolfram). The dimensionless geometric points from the *real number line* are *only* in the *past* (Fig. B) at which the Dragon has caught its tail (Slide 1). Thus, all 4D spacetime points, on which one can define metric (Sic!), are in the irreversible *past*, whereas the *future* is a *pre-geometric Platonic* plenum hidden by the “speed” of light, which leads to 4+0-dimensional spacetime (p. 20 in [GR\\_textbook.pdf](#)). If we denote two *consecutive* physical states in the irreversible *past* with  $Q_1$  and  $Q_2$ , the atom of geometry  $\Delta T = (Q_2 - Q_1) > 0$ , yet there is no *physical* stuff “between”  $Q_1$  and  $Q_2$ , which makes *It* “that which has no part” (Euclid). In other words, at every consecutive 4D instant ‘here and now’, the physical world has *already* passed through the *pre-geometric Platonic* plenum (p. 9 in [BCCP](#)) “between”  $Q_1$  and  $Q_2$ : *It* is *always inside us*.

Again, we do not identify the *Platonic* plenum, called *It*, with God (John 1:1; Luke 17:21), because in the doctrine of *trialism* (p. 3) we treat them as two *complementary* explications of Nature, in the same way physicists treat the quantum “particles” and quantum “waves” as two *complementary* presentation of quantum phenomena, in line with *wave-particle duality*. There is no need to introduce the so-called *anthropic principle* – “the universe would not even be possible if the laws of the universe had been incompatible with the development of sentient life” – because in the doctrine of *trialism* (p. 25 in [BCCP](#)) matter and psyche spring from their common source, and are therefore *pre-correlated* (Leibniz) from *the Beginning*.

To your objection [above](#): two invariant *spacetime* intervals with size 1 m and 1000 m<sup>‡</sup> will always have *identical* “non-numbers” of *uncountably infinite* atoms of geometry, and hence the intervals can be “inflated” and “deflated” by introducing *calibrated flexible* metric on them: see the 4D spacetime *grid* at p. 2 [above](#) and the *origin* of gravity at p. 3. Again, the phenomenon which *calibrates* the *flexible* spacetime metric (p. 2) is not physical (p. 3). We are *not* doing *metrology*, like the duration of 9,192,631,770 periods (= tiles, see Fig. A) of the radiation “corresponding to the transition between the two hyperfine levels of the unperturbed ground state of the <sup>133</sup>Cs atom”. You may not reproduce an invariant *spacetime* interval (p. 2) with matter alone. You also need ‘*something else*’ (C.J. Isham and J. Butterfield). *Capiche?*

To wrap up, let me go back to the *convoluted statement* from the YouTube video by Fermilab at p. 2 [above](#): we all “fly” with the invariant “speed” of light, so if we are at relative rest and do *not* “consume” 3D space, we are not going anywhere, yet at *the same* instant we “fly” in time.

Sounds weird ([Ethan Siegel](#)). Let me show in Fig. C a snapshot from the video at [p. 2](#), whereas Fig. D (source [here](#)) shows how, relative to the platform, “time on the train completely stops.”



Fig. C

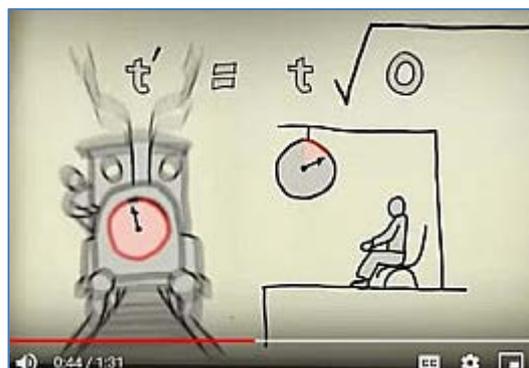


Fig. D

NB: But the train itself (Fig. D) is a photon endowed with **imaginary** ([Arthur Eddington](#)) Time ([p. 3](#)). It lives only at **null intervals** at which  $(\Delta x)^2 = (\Delta ct)^2$  viz.  $x = \pm ct$ : “A photon arriving in our eye from a distant star will not have aged, despite having (from our perspective) spent years in its passage” ([Wikipedia](#)). The most important events happen at **null intervals** ([Kevin Brown](#)): see [Slide 2](#) and the drawings at [p. 21](#) in [BCCP](#), and then replace 0 in Fig. D with the so-called **hyperimaginary** unit  $|w|^2 = 0$ . This is how I introduce the *global mode* of spacetime ([p. 31](#) in [about\\_spacetime.pdf](#)) pertaining to the global Heraclitean Time  $t'$  of the photon:  $t' = t (\pm w)$ . Notice the new *quantization* of 4D spacetime at [p. 9](#) in [BCCP](#), reproduced below, and read the explanation therein. Physically, the **proper time**  $t'$  of the photon is **zero** (Fig. D):  $t' = t (\pm w)$ .

[---one photon---]between[---one photon---]between[---one photon---

The *global mode* of spacetime is being **re-nullified** at every 4D instant ‘here and now’ (Fig. E), leading to 4+0-dimensional spacetime ([p. 9](#) and pp. 19-20 in [GR\\_textbook.pdf](#)). We need **new physics**, and I suggested the international conference *GRAVITY 21* in March 2021 ([p. 3](#)). But how about the **rate of Time**? No clock can “measure” 1 s/s. Let me zoom on the **rest frame** ([p. 4](#)).



Fig. E, Slide 1

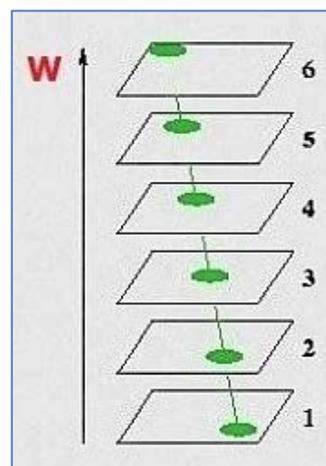


Fig. F, Photoshop layers

Once you merge all layers in Fig. F, you will nullify **W** and will obtain a *continual* line, =====, in which all **uncountably infinite** segments ([p. 4](#)) are *atoms of geometry* in Fig. B at [p. 4](#) above. And the variable **rate of Time** will **assemble** the interval (=====) with flexible RS size ([p. 2](#)). Now we can explain the *origin* of gravity ([p. 3](#)) and proceed to **cosmology** and **physical theology**.

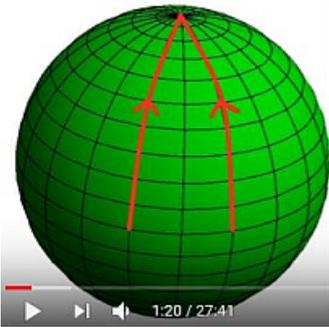
O2. Your [ideas](#) are too speculative and cannot be accepted.

A2. Speculative: relative to what? Let me remind you some *accepted* ideas in [GR textbooks](#).

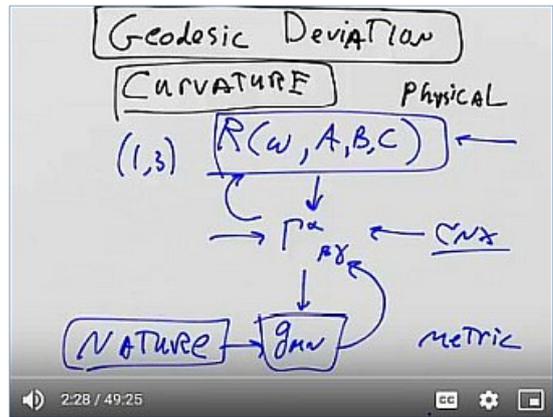
In the presence of gravity ([John L. Synge](#)), conservation laws do *not* exist ([Hans Ohanian](#)). You will have to explain the conversion of "*intangible energy*" ([Hermann Bondi](#)) to the *tangible one, and back*. Thus, the idea of some "*geodesic*" is too speculative and cannot be accepted. Also, GR is a classical theory, and so for systems described by a classical Lagrange action you need a well-defined *boundary* of the integration domain to suggest conservation laws: [W. Wyss, p. 304](#). But gravity is fundamentally *non-local* ([Laszlo Szabados](#)), so the idea of "*edge of space-time*", shown with Cauchy surface endowed with some "edge ( $\Sigma$ ) =  $\emptyset$ " ([Robert Wald](#)), is an oxymoron. You also need a well-defined *boundary* of the universe ([R. Penrose](#)) to define the mass '*there*': "Mass *there* governs spacetime geometry *here*" ([John A. Wheeler and Ignazio Ciufolini, p. 270](#)). Thus, the "explanation" of *inertia* is too speculative and cannot be accepted ([Kevin Brown](#)). To quote [Matt Visser](#): "The essence of the problem lies in the fact that the Einstein equations of general relativity are local equations, relating some aspects of the spacetime curvature at a point to the presence of stress-energy *at that point*. What general relativity does *not* do is to provide any natural way of imposing *global* constraints on the spacetime – certainly the Einstein equations provide no such nonlocal constraint. In cosmology this leads to the observation that the global topology of space is not constrained by the Einstein equations; spatial topology is an independent discrete variable that has to be decided by observation." But the spatial topology cannot be "decided" by observation, simply because there is too much "*mystery matter*".

Back to the "local" manifestation of gravity: try to explain Earth tides ([Wikipedia](#)) by using the accepted ideas in GR textbooks (p. 1 in [GR\\_textbook.pdf](#)). Can you convert gravity as geometry to the *enormous* physical force producing [Earth tides](#)? By some deviation from [geodesics](#) maybe? Watch the video lectures below and read about the gravitational "pizza" in [gr\\_energy.pdf](#).

- In curved spaces a geodesic is a curve whose tangent vectors remain parallel to each other as they are parallel transported along the curve in infinitesimally small incremental steps ( $\lambda$  to  $\lambda + d\lambda$ ).



- On the sphere, geodesics take the form of great circles, two of which are partly shown here in red.



Sorry, this "deviation" is too speculative and cannot be accepted. Moreover, it totally misses the task of explaining the [Earth tides](#) ([V. Petkov](#)). Imagine you at your terrace in a summer day. You are looking at the readings of your weather thermometer (pp. 2-4 in [Unruh.pdf](#)) and notice two things: (i) the readings are "deviating", and (ii) the weather is getting warmer. Would you speculate that the "deviations" of the readings of the thermometer have *caused* the warming? Are you getting old *because* your hair now is whiter than 5 years ago? More at p. 16 in [facts.pdf](#).

O3. There is no "flow of Time" ([C. Rovelli](#)), only [global hyperbolicity](#). This is a [well-known fact](#).

A3. There is no *physical* stuff ([Fig. G](#)) at "*absolute rest*", which could [propel](#) the entire universe along the global Heraclitean Time (p. 2). Otherwise the Theory of Relativity will be demolished (p. 3). As [Asher Peres](#) used to say, these things are well known to those who know things well.

Back in [January 1990](#), I wrote: “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.” Put aside the mind-matter problem (the doctrine of [trialism](#), p. 25 in [BCCP](#)), and focus on the *topology* of spacetime shown with the new ‘atom of geometry’, Fig. B at [p. 4](#): if you can prove it wrong, the theory of Heraclitean Time ([p. 2](#)) – *Panta rhei conditio sine qua non est* – will be obliterated. Let me explain the conditions under which the entire theory ([p. 5](#)) will be proven wrong.

Look at Fig. G below: can you make the ‘burning cord’ *physical* (not “dark”) and hence resolve “the worst theoretical prediction in the history of physics!” ([Mike P. Hobson et al.](#))?



Fig. G, pp. 27-32 in [GR\\_textbook.pdf](#)

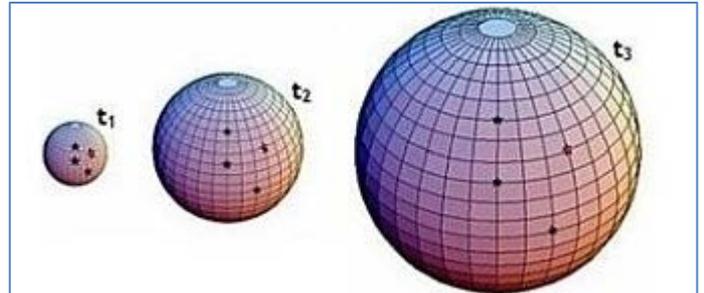


Fig. H, [Slide 2](#)

Physically, the *atemporal Platonic world* is always **nullified** at  $t_1$ ,  $t_2$ ,  $t_3$ , etc. (Fig. H). We can see with light ([p. 20](#) in [GR\\_textbook.pdf](#)) only matter acting on *itself*: the universal **self-action** (*ibid.*, [p. 6](#)) by the **Unmoved Mover** – Der Geist bewegt die Materie (*Mens agitat molem*, [Virgil](#)). If in [life science](#) we followed the “logic” of many (otherwise **smart**) physicists, we would have to declare some “dark” computer in the **human brain**, which of course **does not and cannot exist**.

Last but not least, the **potential** future in the ‘atom of geometry’ (Fig. B at [p. 4](#)) is making the so-called **negative mass** *physically* unobservable, resembling Eliot’s cat Macavity ([Adam Helfer](#)). It is **Platonic** reality as well ([p. 6](#) and [p. 23](#) in [GR\\_textbook.pdf](#)), which I believe can be tested with two experiments ([p. 1](#)). The proof of concept will be demonstrated at [GRAVITY 21](#) ([p. 3](#)).

O4. You suggest purely metaphysical ideas.

A4. I suggest two *modes* of spacetime: local (physical) mode in which distances in 3D space and duration in time are defined with *metric* (Fig. A on [p. 4](#)), and a global **Platonic** mode, which is **bootstrapping** all physical points of the local (physical) mode: “Every two points in spacetime are connected by a contiguous set of lightlike intervals whose absolute magnitudes are **zero**” ([Kevin Brown](#)). Once you blend the two spacetime *modes* with the *atom of geometry* (Fig. B), you will obtain **Quantum Spacetime** and Causal Field (pp. 6-7 in [wegtransformierbar.pdf](#)). The theory ([p. 5](#)) has unique predictions ([p. 7](#) in [facts.pdf](#)), which can be tested with **experiments**. I do not predict some “runaway process” but an enhanced **holomovement**. More at [GRAVITY 21](#).

O5. You have not published any experimental tests of your theory.

A5. But what if I am wrong ([p. 3](#))? As I wrote in February 2020 ([p. 8](#) in [wegtransformierbar.pdf](#)): “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”. The second equation in [p. 5](#) above is also in symbolic form, firstly because the postulated *hyperimaginary numbers* are not spelled out in details. We need hypercomplex analysis, but I am not mathematician. Nobody has so far responded to my numerous **messages**. My proposal for producing electricity at [p. 1](#) is **the only** option to reduce CO<sub>2</sub> emissions by 7.6 per cent *every year* from 2020 to 2030. If we **fail now**, by 2025 the cut needed will jump to 15.5 per cent *every year* ([p. 28](#) in [BCCP](#)). Yet **nobody cares**. And nobody is even trying to explain the effect of gravity we see **every day**: Earth tides ([p. 6](#)).

Suppose, just for the sake of the argument, that next summer some guy decides to fly over the [River Thames](#) in London. Many tourists there will be fascinated (they *love free entertainment*), but will the established mathematicians and theoretical physicists suddenly become interested in the *origin* of gravity (p. 6), [general topology](#), [set theory](#), and [number theory](#)? [When pigs fly](#).

O6. Your “[hyperimaginary unit](#)”,  $|\mathbf{w}|^2 = 0$  (p. 5), makes no sense. It is absurd.

A6. Does the [Born rule](#) from 1926 make *any* sense? Yet it works very well, as long as you are not trying to understand it – just ‘[shut up and calculate](#)’. The condition  $|\mathbf{w}|^2 = 0$  and the ‘general rule’ ( $1 + \mathbf{0} = 1$ ), explained at p. 20 in [facts.pdf](#), are still in symbolic form, waiting to be uncovered. Both the gravitational energy ([MTW p. 467](#)) and ‘the quantum state’ ([John](#)) are [wegtransformierbar](#). If it were possible to “discover” a *local* expression for the gravitational field energy density, the gravitational field will be a local tensorial observable and gravity will become [classical force field](#) (p. 5 in [GR\\_textbook.pdf](#)). Read about the [hyperimaginary numbers](#) in p. 8 in [GR\\_textbook.pdf](#) and pp. 20-22 in [BCCP](#), and recall ‘the two rules for success’ at p. 1.

O7. “Buzz off, idiot!” (email by [Prof. Dr. Maurice de Gosson](#) at the University of Vienna, dated Mon, 21 May 2012 18:47:46 +0200).

A7. No comment.

Please do not hesitate to send your objections (p. 4) to [spacetime engineering](#). In my opinion, in order to understand the phenomenon applying *instantaneous “brakes”* to an accelerated body, we should start with the phenomenon applying *instantaneous pull up↑* ([Slide 2](#)) to the entire 4D universe *en bloc* and hence making it “fly” ([John A. Wheeler](#)) in Time ([Slide 1](#)). More about the large scale structure of spacetime ([S. Hawking and G.F.R. Ellis](#)) will be delivered at [GRAVITY 21](#). I will first argue that bodies in [free fall](#) do not trace the *rate* of global Heraclitean Time (p. 2). The latter is fully transparent, until they become [accelerated](#), at which instant the same bodies will *instantaneously* recover their “latent” [weight](#) and [inertia](#). In order to fly, now you have to tweak your local *rate* of global Heraclitean Time until your local weight is exactly compensated by *repulsive* gravity (p. 3). Then you can [fly your body](#) in the same way you move your thoughts in your [brain](#) (p. 5 in [wegtransformierbar.pdf](#)). It is called REIM, from ‘reversible elimination of inertial mass’ (p. 1). Works like a Swiss watch. [How?](#) Read the facts in pp. 18-20 in [facts.pdf](#).

Notice that there is no privileged direction in 4D spacetime, which could be mapped to the axis [W](#) in [Slide 2](#). This ([hyperimaginary](#)) “direction” is always [nullified](#), leading to 4+0 D spacetime (p. 5) endowed with global Heraclitean Time and non-trivial topology inducing [spin/rotation](#) in the physical world ([Wolfram](#)). This is *completely* uncharted territory (p. 3). I assume that the global phenomenon, applying *instantaneous pull up↑* ([Slide 2](#)) to the entire 4D spacetime, is creating topological rotation as well (p. 1). As a crude analogy, see the [right-hand rule](#) in Fig. I, and in Fig. J the [centrifugal](#) and [centripetal](#) forces at the 4D event [P](#) reproduced from [Slide 2](#).



Fig. I. The axis [W](#) along [null intervals](#).

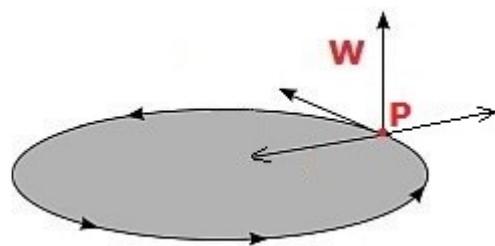


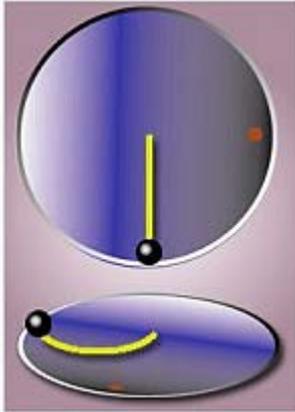
Fig. J. See Fig. B on p. 21 in [BCCP](#).

The [centripetal](#) and the [centrifugal](#) vectors in Fig. J show the attractive vs. repulsive gravity in

dynamic equilibrium (p. 3), whereas **P** belongs to the rotating-and-inflating 1D ring therein, taken from the rotating-and-inflating 4D spacetime (not just "3D space"). To fully understand the importance of normal and tangential directions at **P**, read the explanation at [this http URL](#). It will be difficult to overestimate the importance of this crucial mathematical fact.

How can we model the (hyperimaginary) curl of the vector **W** (Fig. I) in Slide 2? We have to get together at [GRAVITY 21](#) and examine all indisputable facts with scrupulous intellectual honesty. Don't let [Kip Thorne](#) fool you again (pp. 1-2 in [facts.pdf](#)). See instead Table 1 on p. 27 in [BCCP](#).

People still [fiercely insist](#) on "spacetime curvature", shown in the drawing at p. 6, so let me use the explanation of Fig. J [above](#) and compare it to the curvature from Coriolis force ([Wikipedia](#)):



"In the inertial frame of reference (upper part of the picture), the black ball moves in a straight line. However, the observer (red dot) who is standing in the rotating/non-inertial frame of reference (lower part of the picture) sees the object as following a **curved path** due to the Coriolis and centrifugal forces (see Fig. J [above](#) - D.C.) present in this frame." However, in our case the [inertial frame of reference](#) (the upper part of the picture) is not physical: read p. 3. In theoretical physics' parlance, the *origin* of gravitational **rotation** is "dark". Hence the **curved path** in the lower part of the picture is caused by topological gravitational **rotation** evoked in the physical, 4D spacetime. Simple, isn't it?

For comparison, if we have a bird-eye view on the *entire* spinning system, e.g., a spiral galaxy, we will see that its [spiral arms](#) are indeed curved. But in our case, we cannot have a bird-eye view on the physical, 4D universe *en bloc*. Such inertial "reference frame" is not physical (p. 3). Can you suggest some Gedankenexperiment with which one could (i) separate gravity from the ubiquitous gravitational rotation and (ii) show that gravity *alone* is related to some "curvature"?

Forget "[spacetime curvature](#)", it leads to a dead end (p. 6). Read Q2 on p. 15 in [facts.pdf](#) and pp. 9-10 in [Unruh.pdf](#). My talk [The Bridge](#) (p. 23 in [GR\\_textbook.pdf](#)) is scheduled for 27 March 2021 at the international conference [GRAVITY 21](#) (limited to 30 participants) in Munich, Bavaria. In order to discuss the [rate of Time](#), we must figure out the unification of space and time with [light-travel time](#) (E.F. Taylor and J.A. Wheeler), mentioned at p. 2, and explain the *dual* time of photons – real and **imaginary** (Arthur Eddington). For example, consider a "rod-and-clock" of 500 sec, which is the *real* time, as measured with a clock, needed for Sun's light to reach the Earth: how would you show this [invariant interval](#) of 500 sec [light-travel time](#) in the [light cone](#)? In my opinion, we need a new model of 4D spacetime, in which the [ct-coordinate](#) has additional degrees of freedom encapsulating the *variable* rate of Time [assembling](#) the 4D "rod-and-clock". The rate of "one second per second" ([Ethan Siegel](#)) is a self-referential poetry, in my opinion.

Should you wish to present your opinion, you'll have to write up a brief paper about [GW150914](#) and upload it at [arXiv.org](#). Then the ball will start rolling (p. 16 in [facts.pdf](#)). See you in Munich!

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I am deeply grateful to the 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

## Addendum

To avoid misunderstandings related to the so-called **4+0 D spacetime** (p. 8 and p. 5) and the *atom of geometry* (p. 4), let me outline my proposal for two *modes* of spacetime, called **local** (physical) and **global (Platonic)**, presented at my talk *The Arrow of Spacetime* on 21 September 2008, on the occasion of Hermann Minkowski's lecture *Space and Time* on 21 September 1908.

Space is obviously real, but what if time is *imaginary* (Henri Poincaré and Arthur S. Eddington)? What is the meaning of  $(ict)^2$ ? Let me step back and try to find evidence of *imaginary time* and Heraclitean *flow* of Time in the global (Platonic) mode of spacetime. The latter is hidden from direct observations, like a Platonic 'hand' in a physical, 4D 'glove' (p. 3 in [gr\\_energy.pdf](#)).

The global (Platonic) mode of spacetime refers to the input from the *atemporal Platonic* state of the entire Universe as ONE (p. 3). Two examples: the physical time can never stop, even if we are at relative rest and do not "consume" 3D space (Fig. K), and the **pull up** of the entire physical world (p. 2), depicted in Fig. L. They do *not* have **physical direction** in 4D spacetime, nor a reference frame in which they can be '*at rest*', and their source is **non-relational** (p. 3).

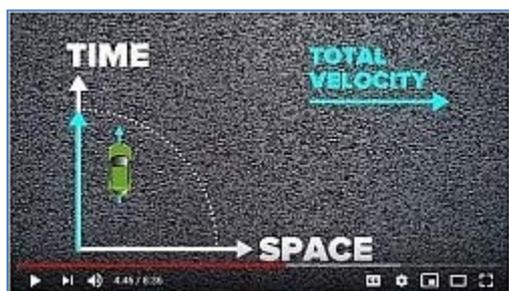


Fig. K, p. 2

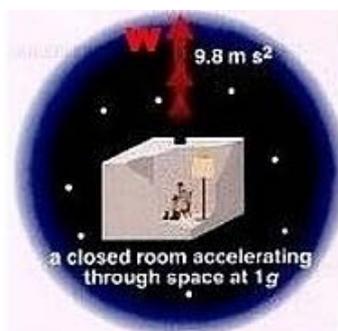


Fig. L, Slide 2

Fig. L may be a bit misleading, because (i) the **elevator**, shown as 'closed room', is *the only truly isolated system* – "the whole universe" (Dennis Sciama) – and (ii) the black "space" is *not* some 'background' with respect to which the elevator can be '*at rest*', but the omnipresent yet **non-relational Platonic Ether** "shown" in Fig. N at p. 11 below.

Thus, I suggested on 21 September 2008 an *arrow of spacetime* produced by 'change in space' and 'change of space'; the former is the coordinate time (*local mode* of spacetime), whereas the latter pertains to the *unobservable* (p. 9 and p. 20 in [GR\\_textbook.pdf](#)) Heraclitean Time (p. 5) in the *global mode of spacetime*. In the *squared spacetime interval*, the fundamental *asymmetry* of the Heraclitean Time – you cannot step twice in the same river, **Heraclitus** – is *exactly nullified*, which leads to **4+0 D spacetime**. Subsequently, the local coordinate time as 'change in space' becomes *real* (not *imaginary*) quantity, which led Hermann Minkowski to unify the real space with the real *local* time into 4D spacetime. To understand the global (Platonic) mode of spacetime, read p. 8 and p. 5, p. 19 in [facts.pdf](#), and my essay on *gravitational energy* ([gr\\_energy.pdf](#)). Statements like "there is no dynamics within spacetime itself: nothing ever moves therein; nothing happens; nothing changes" (Robert Geroch) are false. Just ignore them. If the dynamics of spacetime were determined exclusively by some *physical* field, we will face the problem of *infinite regress* – 'turtles all the way down'. Physically, **It** has to be **nullified**. The Platonic state of the Universe as ONE (p. 3) exists *only* in the **future**: Fig. B in p. 4 above. More at the international conference *GRAVITY 21* (p. 13 in [GR\\_textbook.pdf](#)). We must reveal the origin of attractive and repulsive gravity (pp. 5-7 in [gr\\_energy.pdf](#)) and then move to the puzzle of how gravity works in the cosmos (p. 3), without any "mystery matter" whatsoever.

**NB:** Most importantly, do *not* allow **Kip Thorne** and his **collaborators** to fool you. Have you seen **pink unicorns** dancing with **red herrings**? This is **GW150914**. Get the facts: pp. 1-6 in [facts.pdf](#).

D. Chakalov

January 2, 2021, 11:41 GMT

## Can you detect the Ether? Yes, with your brain.

What is Ether? **It** (not "He") is the **Platonic** state of the **entire Universe** as **ONE** (p. 3): read p. 7 and the outline at p. 10 [above](#), and my email from 21 December 2020 to [Friedwardt Winterberg](#).

To illustrate how easy is to learn (p. 19 in [facts.pdf](#)) **spacetime engineering**, try the experiment with your **brain** at p. 5 in [wegtransformierbar.pdf](#). It is indeed very easy, like learning to juggle three balls (p. 13 in [synopsis.pdf](#)). I tried to explain the task in my talk from [April 2014](#); more in March next year (pp. 21-24 in [GR\\_textbook.pdf](#)). Let me suggest two **coordinate-free** analogies of the Ether; see the "background" in Fig. 2, Fig. 3 and Fig. 4 at pp. 14-15 in [GR\\_textbook.pdf](#).

You can't paint a **colorful** painting without a colorless **canvas**. The canvas (background) will be "**nullified**" and will *not* be observable. It will be like the vertical wall in [Plato's cave](#): we see only the fleeting **4D** shadows, not the screen/canvas. Why? Because the 'canvas' itself is not observable with light (Sic!): see Fig. B at p. 4 and Fig. N below. **It** is called Ether ([Wikipedia](#)).

To visualize the Ether, let me first show what **It** is not: see Fig. M below (p. 3 in [gr\\_energy.pdf](#)), depicting a *finite* domain of the physical 4D world built by elements "—" endowed with **metric**, **CPT invariance**, and the so-called Archimedean topology (pp. 15-17 in [about\\_spacetime.pdf](#)).

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Fig. M. Read p. 9 in [BCCP](#).

Notice that all elements "—" in Fig. M (resembling **consecutive** 4D snapshots from a **movie reel**) must be **separated** by 'something **else**' ([Isham & Butterfield](#)), called Ether. But we *cannot* see the Ether in Fig. N below. **It** is the so-called Zenon Connection: p. 5 in [gr\\_energy.pdf](#). **It must be nullified** (p. 10) in the physical world (Fig. M), or else the **Ether** will become a **physical** entity.

Fig. N

Nowadays people reject the omnipresent yet **non-relational Platonic** Ether (p. 10) "shown" in Fig. N above, but fail to explain "the time-reversal symmetry breaking" ([Wikipedia](#)), which singles out a **preferential time direction** and thus makes a distinction between **past** and **future**. Surely one can *post factum* distinguish past directions from future directions by "measuring the increase in entropy" (R. K. Sachs and H. Wu, *General Relativity for Mathematicians*, Springer-Verlag, 1977, p. 27), but the **second law of thermodynamics** cannot create distinction between **past** and **future**. It will be like saying that I am getting old *because* my hair is getting whiter. Yet people stick *exclusively* to the physical world (Fig. M), despite the bold fact that there is no **physical** stuff (Fig. O) that can create 'time as change'. My approach is different (Fig. P).



Fig. O. Read p. 28 in [GR\\_textbook.pdf](#).

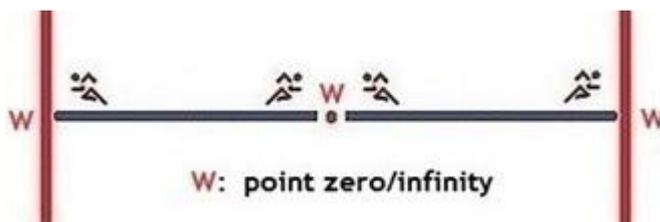


Fig. P. Read p. 10 in [GR\\_textbook.pdf](#).

Can we detect the Ether? Yes we can, although **It** is **UN**speakable: read pp. 22-24 in [zenon.pdf](#).

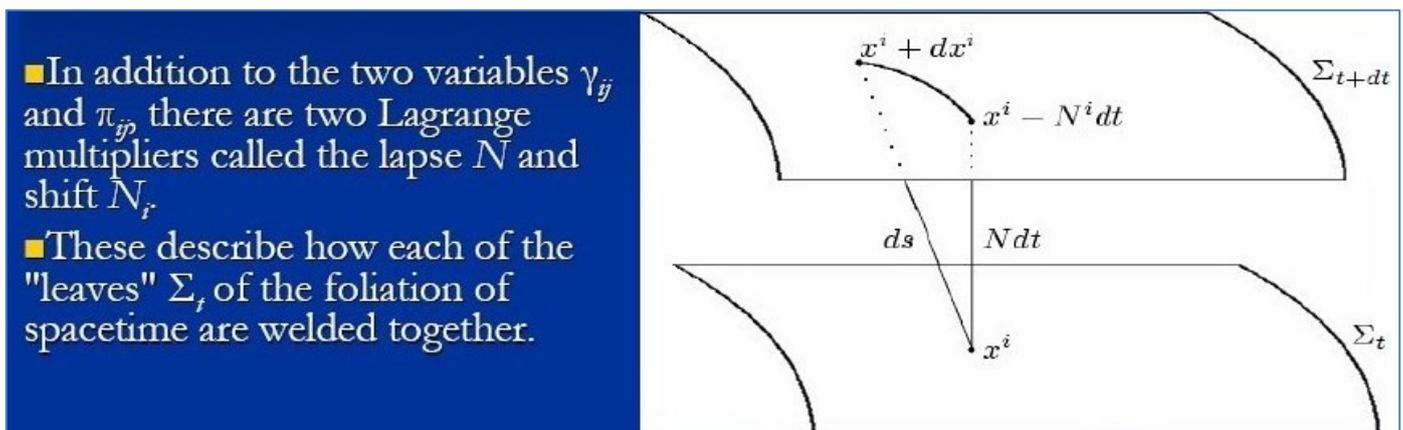
I wrote about the **UN**speakable feature of human memory 22 years ago, on [20 December 1998](#). And since I model the entire Universe as a Brain, the local one above your neck is embedded in the Universal Brain by their common [Quantum Spacetime](#). The 1911 puzzle of 'quantum time' ([Charles Wilson](#)) is still unsolved. Read [Werner Heisenberg](#) and [Erwin Schrödinger](#). The puzzle of 'gravitational time' is also unsolved, because it "has no metric properties and is not observable" ([C. Rovelli](#)) – read about General Relativity at p. 10 in [gr\\_energy.pdf](#). The list goes on and on.

We need [hyperimaginary numbers](#) and [new physics](#) to develop [quantum cosmology](#) and physical theology: pp. 29-30 in [about\\_spacetime.pdf](#). As to learning [spacetime engineering](#), the main task is to develop the complementary view on the 4D physical world ('glove', p. 10) from the **nullified** Ether. You will be able to "see" all points in the physical world *simultaneously* from all directions in 4D spacetime, including the inner structure of solid objects and things obscured from 3D viewpoint; for example, all six sides of an opaque box ([Wikipedia](#)) and, *at the same instant*, everything *inside* the box, from "inside out": see Fig. B, pp. 11-12 in [GR\\_textbook.pdf](#) and try counting the little cubes at p. 8 in [q\\_coin.pdf](#). Soon you will learn how to "look" at the *atemporal Platonic* image of the entire opaque box (pp. 5-7 in [wegtransformierbar.pdf](#)). Again, read how to juggle three balls at p. 13 in [synopsis.pdf](#). Once you learn the theory, it will guide you like a navigation map. You won't need any special "training". It is all about **learning**. Keep in mind that we always work with two *complementary* explications of Nature: read about the doctrine of *trialism* at p. 25 in [BCCP](#), pp. 10-11 in [q\\_coin.pdf](#), and p. 9 in [about\\_spacetime.pdf](#).

Everything said [above](#), and also all my work since January 1972 (p. 26 in [about\\_spacetime.pdf](#)) will be immediately proven *false* iff the crucial statement by Robert Geroch is correct (p. 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."

What is the difference between the statement above and the so-called Zenon Connection (p. 5 in [gr\\_energy.pdf](#)) "shown" in Fig. N at p. 11? Recall the lapse  $N$  and shift  $N_i$  in ADM hypothesis:



The lapse  $N$  and shift  $N_i$  belong to 4D spacetime, correct? **JAIN**. Read p. 9 and p. 21 in [BCCP](#).

Yes, because  $ds$  and  $N dt$  in the drawing above belong to the *physicalized* 4D spacetime, and are located in the *irreversible* past: see the infinitesimal ([Wolfram](#)) denoted  $(Q_2 - Q_1)$  in the new *atom of geometry* depicted in Fig. B at p. 4 [above](#). NO, because the "welding" (**Sic!**) of the leaves  $\Sigma_t$  ([E. Courgoulhon](#)) is not made by the *physicalized* 4D spacetime in the *irreversible* past (Fig. M), but by the **Platonic future** (the 'hand') in Fig. B at p. 4. Read again about the Zenon Connection (p. 5 in [gr\\_energy.pdf](#)) and the **nullified** Ether "shown" in Fig. N at p. 11. Does light travel in 4D spacetime (Fig. M and p. 8 in [gr\\_energy.pdf](#))? **JAIN**. Read p. 9 in [BCCP](#).

Again, the fundamental Heraclitean **Time** is inevitably and necessarily **nullified** in the physical, time-symmetric **4D** spacetime ([Fig. M](#)) due to the *squared* (Sic!) invariant spacetime interval ([Robert Wald](#)), which led to the infamous statement by Bob Geroch at [p. 12](#) and [Fig. N above](#).

Arlen Anderson posed the question “what time does the clock show?” ([gr-qc/9507039v1](#), p. 2) and hoped for “a novel direction in quantum geometry which redresses the traditional unequal treatment of space and time in the quantum theory” (*ibid.*, p. 17). I believe we should address [Quantum Spacetime](#) by correcting the unequal treatment of space and Heraclitean **Time** ([p. 2](#)) in the Theory of Relativity ([Slide 2](#)), and suggested **4+0** D spacetime ([p. 20](#) in [GR\\_textbook.pdf](#)). But as of today, there is no genuine interest in my theory of [spacetime](#) and [Geometry](#). The only feedback so far hit me eight years ago from Prof. [Maurice de Gosson](#) at the University of Vienna: “Buzz off, idiot!” (Mon, 21 May 2012 18:47:46 +0200). Sorry, I can’t communicate with [Russians](#).

There will be much more at *GRAVITY 21* ([p. 13](#) in [GR\\_textbook.pdf](#)): don’t miss **NB** at [p. 10](#). [LIGO and Virgo](#) will need a new theory of [quantum gravity](#) to dream about their [GWs](#). Forget it.

The so-called [GW150914](#) is indeed **FRAUD**. Don’t ever say that you knew nothing about it.

The hottest places in Hell are reserved for those who,  
in times of great [intellectual crisis](#), prefer to stay silent.

[D. Chakalov](#)

December 31, 2020

Last update: January 3, 2021, 14:30 GMT