

## Can Penguins Drink Warm Water?

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### Abstract

A gentle reminder of the origin of gravity and [GW150914](#), with illustrations.

Let me begin by quoting from W.G. Unruh, *Time, Gravity, and Quantum Mechanics*, arXiv:gr-qc/9312027v2, 17 Dec 1993, <https://arxiv.org/abs/gr-qc/9312027v2>:

p. 4: "The lesson of these experiments would appear to be that gravity alters the way clocks run. Such a dependence of time on gravity would have been strange enough for the Newtonian view, but General Relativity is actually much more radical than that. A more accurate way of summarizing the lessons of General Relativity is that gravity does not *cause* time to run differently in different places (e.g., [faster far from the earth than near it](#)).

"Gravity *is* the unequable flow of time from place to place. It is not that there are two separate phenomena, namely gravity and time and that the one, gravity, affects the other. Rather the theory states that the phenomena we usually ascribe to gravity are actually caused by time's flowing unequably from place to place.

p. 5: "The crucial point is that one can alternatively explain this essential attribute of gravity by assuming that time flows unequably from place to place, without calling into play any 'force of gravity' at all."

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 W. Unruh, No Time in Quantum Gravity. In: *Gravitation: A Banff Summer Institute*, ed. by R. Mann, P. Wesson (Singapore: World Scientific, 1991), pp. 260-275.

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 William G. Unruh and Robert M. Wald, Time and the interpretation of canonical quantum gravity, *Phys. Rev. D* 40(8), [2598-2614](#) (1989).

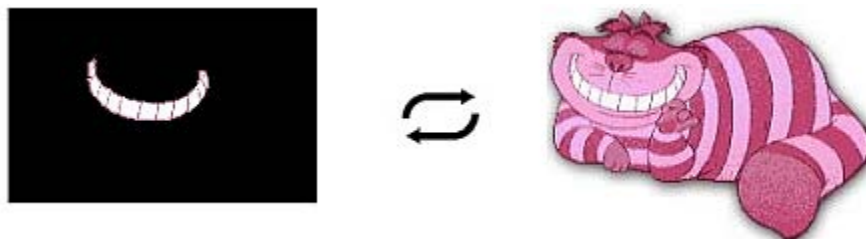
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 Read also John Baez, *Struggles with the Continuum*, 1 Feb 2018, [arXiv:1609.01421v4 \[math-ph\]](#):

"One might hope that a radical approach to the foundations of mathematics – such as those listed above – would allow us to sidestep these problems. However, I know of no significant progress along these lines. (...) Is the continuum [as we understand it](#) only an approximation to some deeper model of spacetime? Only time will tell. Nature is providing us with plenty of clues, but it will take patience to read them correctly."

It is extremely difficult to induce penguins to drink warm water (John W. Coleman).

Let me stress that “penguins” like [W.G. Unruh](#), [John Baez](#), and their [colleagues](#) have no choice: read the *facts* at p. 20, p. 25, and p. 39 in [Can Geometry Produce Work](#).

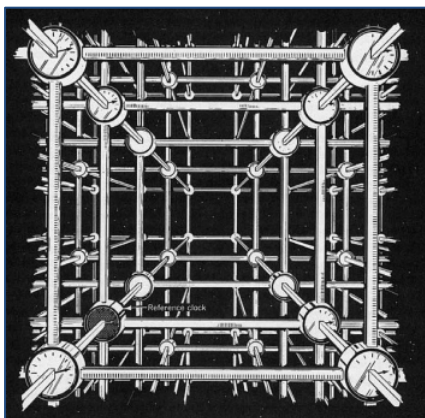
There are three cats in quantum gravity: the grin of the Cheshire cat *without* the cat (as observed by [Alice](#)), the [Schrödinger’s cat](#), and T.S. Eliot’s cat [Macavity](#).



“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 [MTW](#) p. 5.

Picture the bare grin of the cat *without* the cat as ‘spacetime without matter’, which is being **re-calibrated**, ever since [The Beginning](#), “in meters of light-travel time”: see Fig. 9 in [Spacetime Physics](#) by E.F. Taylor and J.A. Wheeler (1965, [p. 18](#)).

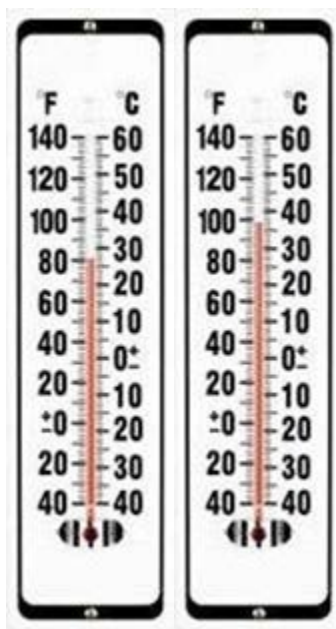


What phenomenon could possibly “calibrate” the **ideal** rods and clocks ([MTW](#) p. 397) that are pre-built in spacetime? For if we manage to *tweak* the **matrix** of light-travel time, we should be able to alter the *rate* of the light-travel time and **reproduce all** the effects of spacetime, called ‘gravity’ ([W.G. Unruh](#)).

As E.F. Taylor and J.A. Wheeler acknowledged: “We assume that *every* clock in the latticework, whatever its construction, has been calibrated in meters of light-travel time.” Calibrated? Can “penguins” understand the *origin* of gravity? Let me explain the puzzle.

Suppose you are at your terrace in a summer day. You look at the reading of your air thermometer, which shows 27° Celsius. The air temperature is caused chiefly by the

Sun (the Cheshire cat at the right-hand side of the drawing above), so if you decide to increase the reading of your thermometer *locally*, by heating it with a hair dryer to 37° Celsius (see below), the air temperature at your terrace will not increase.

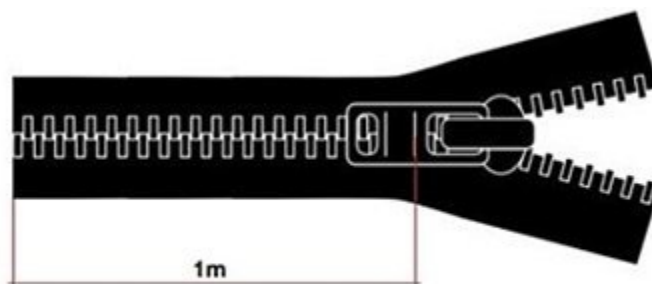


People consider “intuitively obvious” that the bare grin of the cat *without* the cat, shown at the left-hand side of the drawing above, is like the powerless thermometer.

NB: But how about [Earth tides](#)? If you use GR ([Wikipedia](#)), how would you [relate/convert](#) the alteration of the *rate* ([W.G. Unruh](#)) of “meters of light-travel time” ([E.F. Taylor and J.A. Wheeler](#)) to the *physical* forces of [Earth tides](#)?

Not in GR. No way. You need to know the **Platonic** origin of [gravitational energy](#). And much more ([D.W. Sciama](#)).

Read about the **re-creation** ([Slide 1](#)) and **re-calibration** of spacetime, ever since [The Beginning](#) (read [above](#)), at p. 25 and p. 39 in [Can Geometry Produce Work](#). Follow the links.



**1m = 3.3 nanoseconds of light-travel time**

There is nothing “[fictitious](#)” in gravity. Unlike the heating of the thermometer above, the tweaking of the complex phase ([C.N. Yang](#)) of what people call “quantum waves” does not require energy. My theory of [quantum gravity](#) is based on **atemporal offer-and-confirmation** waves ([Slide 3](#)), under perpetual [non-conservation of energy](#). Here comes the so-called [evolution equation](#). Will be happy to explain it [in details](#).

On a side note, notice the similarity of the origin of gravity and the action of the human mind on its [brain](#): both gravity and the mind can [interact](#) with their respective sources, yet neither gravity nor the mind can be *physical* stuff, for different reasons. Read the last paragraph at p. 15 in [Time and Continuum: Zenon Manifold](#).

23 June 2020

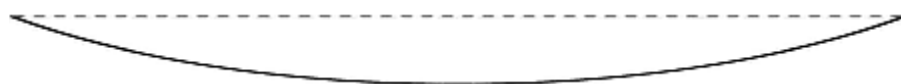
Final version: 30 June 2020, 11:33 GMT

## Questions and Answers

Q1. What's the point you wish to make with the [thermometer](#)?

A1. In GR textbooks ([Wikipedia](#)), the gravitational energy is [wegtransformierbar](#).

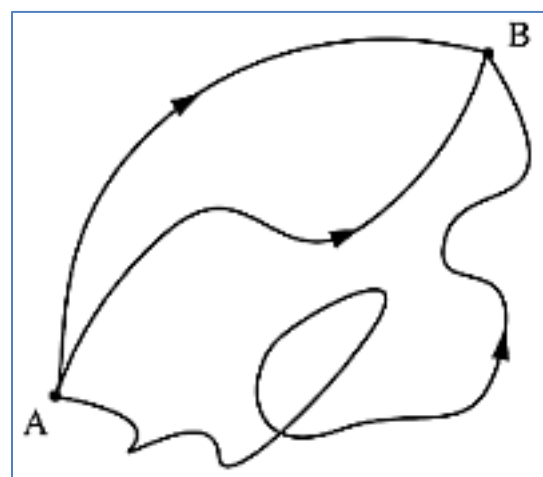
Look at the drawing below: what do you see?



Obviously, this is an elephant walking on a tight rope, only it fell off *exactly* at the instant (*Sic!*) you looked at it, just like Eliot's cat [Macavity](#). Why? Because in the good old GR textbooks ([MTW p. 467](#)) the gravitational energy is *not* localizable. It is a weird "non-local" animal ([H. Ohanian and L. Szabados](#)). Hence the problem with explaining the Earth tides [above](#).

Let me use another example. Suppose you heat up your coffee in a microwave "that heats and cooks food by exposing it to electromagnetic radiation in the microwave frequency range" ([Wikipedia](#)). If you *think* of [EM radiation](#) as gravity, you will make it a *physical* field. False. According to your GR textbooks, you may change — by hand — the coordinates of your coffee cup in the microwave to "[freely falling coordinates](#)" and turn off the "[wegtransformierbar](#)" (read [above](#)) microwave. Do you [smell rat](#)?

Forget GR (p. 45 in [Can Geometry Produce Work](#)). Read again 'three cats in quantum gravity' [above](#). As an illustration (*not* explanation), consider a quantum-gravitational train, which has to reach Hamburg (B) from Munich (A), depicted below. The train will have to find its path by following the [principle of least action](#), discovered by Gottfried Wilhelm von Leibniz in 1707 (no typo). How? By [anticipating](#) all *potential* railroads.



Why? Because the quantum-gravitational train does *not* have pre-determined railroad ahead. The train *creates* its own railroad, as it moves from Munich (A) to its [infinitesimal next step](#) ( $A + \Delta t$ ), until it *creates* its entire railroad to Hamburg (B) with the [principle of least action](#). Click [here](#) to see how it works. This is the idea of *biocausality* from January 1990: read p. 6 in [Can Geometry Produce Work](#). And since the train is *quantum-gravitational* object, all of its [Platonic pre-geometric states](#) (dubbed [John](#)) are "[wegtransformierbar](#)" and are [nullified](#), leaving only their *physicalized* 4D "[jackets](#)".

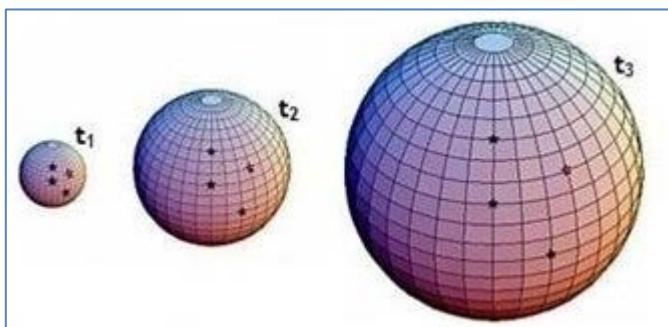
Details at the conference [GRAVITY 21](#) (pp. 25-26 in [Can Geometry Produce Work](#)).

Q2. Do you have experimental predictions? What can you “cook” with your theory?

A2. The theory has unique experimental predictions based on the so-called [evolution equation](#). I hope to explain my equation [in details](#) at the conference *GRAVITY 21* on 26-27 March 2021 in Munich (mentioned [above](#)). As to the second question, I believe can cook you a delicious dinner with my equation: spacetime engineering. If you are tempted to ‘[drink warm water](#)’, read again about the [quantum-gravitational train](#) and pp. 5-9 in [Gravitational Energy](#).

Q3. Regarding the train [above](#), what do you mean by **Platonic pre-geometric** states?

A3. Read p. 2 and p. 6 in [Can Geometry Produce Work](#). The *pre-geometric Platonic world* (*Res potentia*) lives along the postulated axis **W** erected at [null intervals](#), depicted in the second drawing below. The first drawing shows the balloon analogy by Arthur Eddington (1933): every 4D point/event on balloon’s 4D surface belongs also to the [nilpotent](#) point from the [radius](#) of the [inflating balloon](#). The axis **W** is both along the unphysical radius of the [inflating balloon](#) and orthogonal to it (explanation [here](#)). It will be difficult to overestimate the importance of this crucial mathematical fact.



Slide 2 from my talk at [GRAVITY 21](#)

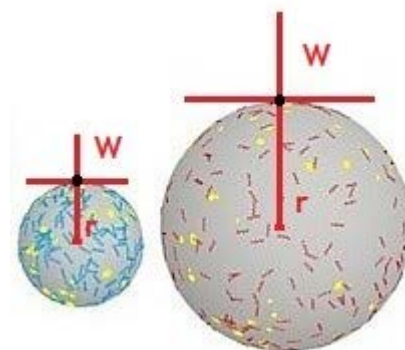


Fig. B, p. 21 in [BCCP](#)

Notice that the *pre-geometric Platonic world* along **W** is always **nullified** in the *squared* invariant spacetime interval  $\Delta s^2$  (R.M. Wald, Ch. 11, [p. 286](#)). If **It** (not “He”) were not **nullified**, one could detect a *physical Aether* and the Theory of Relativity will be demolished. People quietly ignore the fundamental *asymmetry* between time and space: all physical systems, even at rest in their reference frames, are evolving in Time ([Fermilab](#)), with different *rates* ([W.G. Unruh](#)). But with respect to *what?* To the *pre-geometric Platonic world*, which is always **exactly nullified** in the physical world on balloon’s 4D surface above. Perhaps one can locate the **Platonic world** by *splitting* the geometric point that “has no part” ([Euclid](#)), as explained at p. 9 in [Can Geometry Produce Work](#). In my opinion, we need new numbers (called hyperimaginary numbers,  $|\mathbf{w}|^2 = 0$ ) to understand the [Continuum](#). Any other ideas?

2 July 2020, 00:48 GMT



Q4: Can you explain gravitation?

A4. This question came on 2 July 2020 by text message from a good friend of mine in Greece (p. 31 in [Platonic Theory of Spacetime](#)). To my knowledge, nobody has so far *explained* gravity, because such explanation will require to reduce the energy *from* gravity to 'something else', e.g., to kinetic energy, like the way your coffee increased its kinetic energy in the microwave from the energy of EM radiation (see p. 4 [above](#)).

In my (not quite humble) opinion, gravitational energy *per se* does not exist in Nature, just as there is no vacuum energy *per se* in Quantum Field Theory (QFT). We observe only the physicalized *mediators* (Q) of vacuum energy, but never the underlying unobservable *zero-point field itself*. To quote Peter Milonni, "an atom, for instance, can be considered to be "dressed" by emission and reabsorption of "virtual photons" from the vacuum." I suggested the metaphor of 'hand in a glove': we observe only the 4D physical 'glove' (Q), and *never* the **Platonic** 'hand' (also dubbed [John](#)) denoted **P**. Read about the transition  $P \rightarrow Q$  at p. 2 in [Can Geometry Produce Work \(A3 above\)](#). Thus, the physical energy *from* gravity poses highly non-trivial puzzle, firstly because of [the universality of gravity](#): the set of all possible Qs from  $P \rightarrow Q$  above includes all macroscopic objects with *positive* mass-energy, from apples ([Newton](#)) and Earth tides (p. 3 [above](#)) to rotating [galaxies](#) and [beyond](#) (p. 40 in [Can Geometry Produce Work](#)). Even today, many people strongly believe, for reasons I was never able to understand, that the mythical "gravitational waves" ([Kip Thorne](#)) can be detected after some "transfer of energy between the field and the detector" that "measures the energy carried away by the gravitational field" ([Piotr Chrusciel](#)).

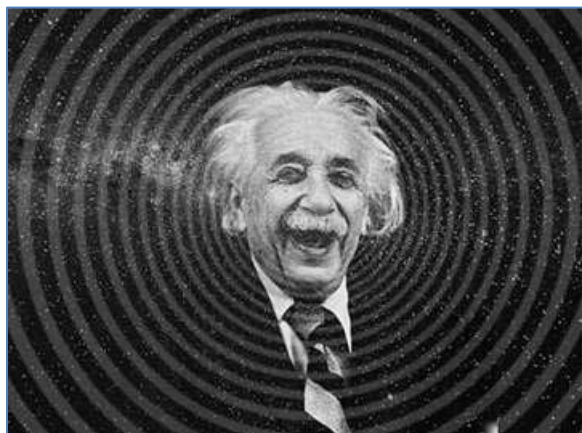
No way José! We can only detect the physicalized *mediators* (Q) of the **Platonic** energy *from* gravity: the [wegtransformierbar](#) **Platonic** 'hand' (**P**) in a 4D 'glove' (Q). To use the example with the microwave (p. 4 [above](#)), your coffee will exhibit *rotation* ([W. Zhao and L. Santos](#)) due to attractive and *repulsive* gravity: watch a clip by Daniel Pomarède [here](#). But you cannot detect the **Platonic** gravitational energy *per se*, just as you cannot detect "a *zero-point field of infinite energy density*" ([Peter Milonni](#)).

Back in October 1920 (excerpt [here](#)), Arthur Eddington spoke about *ethereal energy* possessing "the chief mechanical properties of matter—viz., mass and momentum". In the context of my ansatz [above](#), the energy-momentum and [angular momentum](#) are delivered by the physicalized *mediators* (Q) of the **Platonic** gravitational energy (**P**), like a **Platonic** 'hand' (**P**) in 4D 'glove' (Q).

As to [GWs](#), you cannot employ them to perform any work *whatsoever*, as proven by Hermann Weyl in his widely known article from [October 1944](#), entitled 'How Far Can One Get With a Linear Field Theory of Gravitation in Flat Space-Time?': "At its present stage our theory (L) accounts for the force which an electromagnetic field exerts upon matter, but the gravitational field remains a **powerless shadow**. From the standpoint of Einstein's theory this is as it should be, because the gravitational force arises only when one continues the approximation [beyond the linear stage](#)."

Read the facts in p. 13 in [Time and Continuum: Zenon Manifold](#). Just the **bold facts**.

Yes, the gravitational radiation does exist, but to understand how it *carries its own sources* (unlike [EM radiation](#), which does *not* carry its sources – charged particles) you have to abandon the linearized ‘spherical cow’ approximation of GR ([J.G. Pereira](#)). You need quantum gravity: read my endnote [here](#). The *physicalized* gravity (Q) *always* carries its **Platonic** sources (P), which Einstein considered “a total field (*Gesamtfeld*) of as yet unknown structure” (p. 13 in [Gravitational Energy](#)):



“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.”

See Escher’s ‘[drawing hands](#)’. To use John’s jackets [metaphor](#), all *mediators* (Q) of gravity are just *physicalized* 4D “jackets” cast from their **Platonic** sources (P) called also *Gesamtfeld* (Albert Einstein). Hence the 4D “glove” (Q) *always* carries its “hand” (P): read p. 6 [above](#). Notice that the *interface* ‘here and now’ in the so-called ‘atom of geometry’ ([Slide 3](#)) *separates* the **Platonic** *Gesamtfeld* (P) from its 4D “jackets” (Q), so that P and Q can preserve their ontologically different nature ([Slide 1](#)). Read again p. 9 in [Can Geometry Produce Work](#) and p. 5 therein, and [A3 above](#).

Let me diagnose your knowledge in GR. Try to create “[gravitons](#)” by waving *rapidly* your arms like a [Hummingbird](#), as suggested by [Kip Thorne](#) (no joke) in ‘Gravitational Waves and Experimental Tests of General Relativity’ from 7.09.2012, [pp. 31-32](#):

*Exercise 27.8 Problem: Gravitational waves from arm waving*

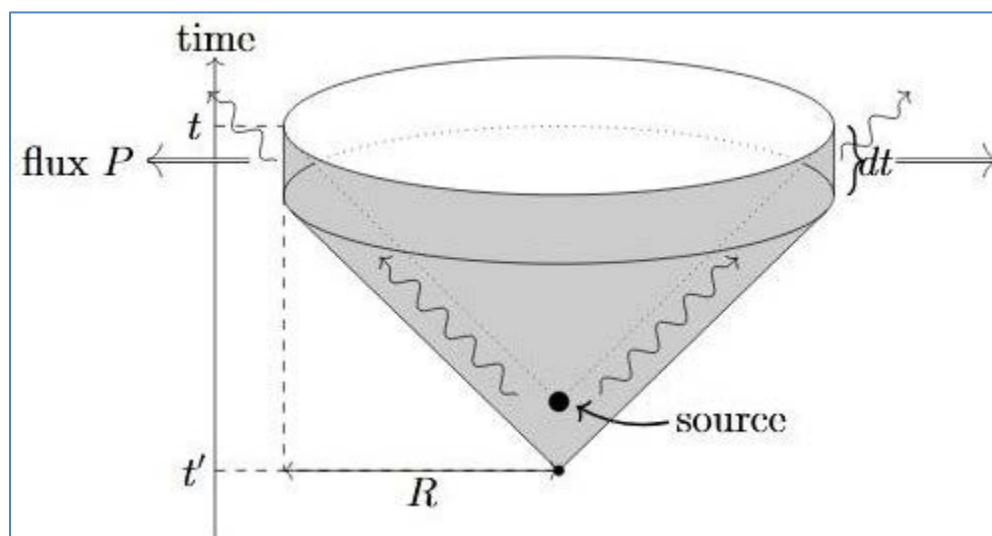
Wave your arms rapidly and thereby try to generate gravitational waves.

(a) Compute in order of magnitude, using classical general relativity, the wavelength of the waves you generate and their dimensionless amplitude at a distance of one wavelength away from you.

(b) How many gravitons do you produce per second?

Go ahead and submit your manuscript to some peer-reviewed academic journal, e.g., *Physical Review D* (PRD). Don't hesitate to use math as much as you can. [Good luck](#).

To those interested in the linearized or 'spherical cow' approximation of GR and the "linear" perturbations of Minkowski spacetime, check out *Lecture Notes on General Relativity* by Stefan Hollands and Ko Sanders, September 2015, Ch. 14, [pp. 107-119](#); their drawing below (explained at p. 117) shows the "energy flux" of GWs (if any).



All you need is to discover some GW "mirror" installed *exactly* at [null-and-spacelike infinity](#), and you will be heading toward 'isolated systems' in GR, which nobody has been able to define. Read [p. 150](#) in Piotr Chrusciel's *Elements of General Relativity* (explanation [here](#)). Not surprisingly, the non-linear GWs ([MTW p. 968](#)) are ignored. Even Bondi's 'news tensor', which estimates (under highly suspicious approximations) the alleged "energy flux" of GWs, is swept under the carpet by LIGO. Forget it. Can you observe pink unicorns dancing with red herrings (called for short [GW150914](#))?

What did LISA Pathfinder *actually* "prove"? That one can have two cubes "isolated from all forces except gravity" ([European Space Agency](#)) in "purely geodesic" motion? This exercise wasted *at least* [450 million euros](#) – all taxpayers' money. **Ridiculous**. Yet the LISA launch ([team members here](#)) is planned for [2034](#). It will waste **BILLIONS**.

I thank Professor Dr. Dr. h.c. [Bernard F. Schutz](#) and Nobel Laureate [Kip S. Thorne](#) for their [illuminating errors](#), which provided crucial (though unintended) help to my quest for understanding [Time and gravity](#). Needless to say, this report reflects my personal, and perhaps strongly biased, [opinion](#). I hope it will be scrutinized by many experts in [differential geometry](#) and [topology](#) at the international conference **GRAVITY 21** on 26-27 March 2021 in Munich (p. 13 in [Can Geometry Produce Work](#)). Qui vivra verra.

4 July 2020

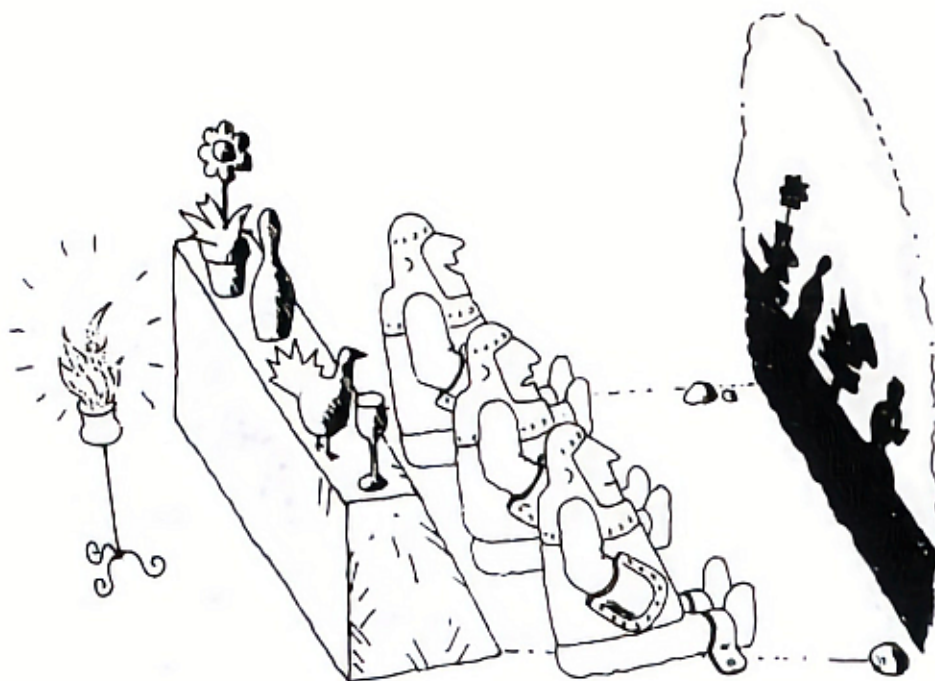
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## The Gravitational Matrix

I introduced (p. 2) the **matrix** of light-travel time, with which one can *reproduce* all effects of spacetime, called 'gravity'. Let me try to explain.

In Platonic theory of spacetime (see [chakalov.net](http://chakalov.net)), the notion of **matrix** (*pl matrixes*) refers to the Platonic world (*Res potentia*), suggested by Plato (p. 9 in [BCCP](#)):



We postulate that the Platonic world is a *third* type of reality, being the origin of both matter (*Res extensa*) and the **noetic world** (*Res cogitans*). In the drawing above, the *atemporal* Platonic **matrixes** are placed *behind* the "chained observers" like you and me, so we cannot turn around and see them. Why not? Because of the so-called "speed" of light: p. 20 and p. 9 (*atom of geometry*) in [Can Geometry Produce Work](#).

The Platonic **matrix** is not physical stuff, like the one used e.g. in [matrix molding](#), as an [enclosure](#) within which something originates or develops. And **it** (not "He") is not mental stuff either. That is, we do *not* endorse the opinion of Max Planck in his 1944 speech *Das Wesen der Materie* [[The Nature of Matter](#)]: "There is no matter as such! All matter originates and exists only by virtue of a force which brings the particles of an atom to vibration and holds this most minute solar system of the atom together. We must assume behind this force the existence of a conscious and intelligent Geist (bewußten intelligenten Geist). This Geist is the matrix of all matter."

Again, the Platonic theory of spacetime suggests *three* types of reality: physical (*Res extensa*), **noetic** (*Res cogitans*), and Platonic (*Res potentia*); for example, the **matrix**.

Subsequently, we **unravel** the Platonic **matrix** in (i) all biological systems (e.g., in the **human brain**, p. 5 in **Gravitational Energy**), (ii) the quantum world (p. 18 in **Can Geometry Produce Work**), and (iii) the macroscopic world governed by gravity (p. 2).

In all three cases, the Platonic **matrix** (A3 at p. 5) acts as an operator  $P \rightarrow Q$ : read p. 2 in **Can Geometry Produce Work** and notice the metaphor 'hand in a glove' at p. 6 **above**. It is manifestly impossible to fix spacetime boundaries without Platonic **matrix** (p. 10 in **Can Geometry Produce Work**) endowed with **self-action** (*ibid.*, p. 6).

Let me elaborate on the gravitational **matrix** (iii). How is it possible to *calibrate* the spacetime in meters of light-travel time (p. 2)? Because the matter doesn't matter.

According to the principle of locality, "to exert an influence, something, such as a wave or particle, must travel through the space between the two points, carrying the influence" (**Wikipedia**), no matter in extragalactic dust or in condensed matter. Thus, the 'light-travel time' of, say, 3.3 nanoseconds (p. 3) does *not* depend on how much physical stuff occupies the space between the points, as if light travels in "vacuum".

Now we suggest gravitational **matrix** fixing 1s of light-travel time — regardless of the physical content of such spacetime region with size app.  $299,792 \times 10^3$  m. Without the gravitational **matrix** fixing the 'standard' 1s of light-travel time, the spacetime will be a total mess, because it will depend solely and *entirely* on the physical stuff in it (the Cheshire cat in the drawing at p. 2). Recall, for example, that the operational definition of 'one second' is passed on radiation produced by the transition between the two hyperfine ground states of cesium (in the absence of any external influences such as the Earth's magnetic field) with a frequency of "exactly 9192631770 Hz", but no physical process could *assemble* any physical stuff to create an *exact* 'one second'. Ditto to 'one meter'. So, what keeps them 'the same' by fixing the *invariant* 1s of **light-travel time**? Only the gravitational **matrix**. The matter (the **cat**) doesn't matter.

We suggest dynamical **re-calibration** of spacetime (p. 2) by the gravitational **matrix**, with which one can **reproduce** all effects of spacetime, called 'gravity' (**W.G. Unruh**). In one sentence, the spacetime is pliant and flexible, which is why it can be *deflated* and *inflated* by the gravitational **matrix**. Physically, the **matrix** is *wegtransformierbar* and is *exactly nullified* (p. 4). This is the unique feature of Platonic **matrix**, as the new *third* type of reality (p. 9), "just in the middle between possibility and reality" (**Werner Heisenberg**). Otherwise **it** will be some "dark" **physical stuff**. To use the analogy with the quantum-gravitational train at p. 4, it will have to be empowered by some idiotic "**mystery matter**", which is sheer **GR parapsychology** (pardon my French).

Read the interpretation of "**dark energy**" and "**dark matter**" at p. 25 in **Can Geometry Produce Work**. Don't miss the analogy with tweaking the air thermometer at pp. 2-3 **above** and the genuine gravitational radiation from Einstein's **Gesamtfeld**, explained at p. 7 in **GW150914**. Try to suggest any other interpretation of gravity. **Good luck**.

To wrap up, let me offer my opinion of the current situation with the Platonic **matrix**.

For comparison, recall [Michael Faraday](#), who suggested in 1852 a new type of physical reality called 'field', and the shocking idea of 'line of force' that can be stretched even "across a vacuum" ([Wikipedia](#)). But he was not exercising in metaphysics. He had a vast number of indisputable experimental facts in [electromagnetism](#), but was not sufficiently fluent in mathematics. Luckily, [James Clerk Maxwell](#), an outstanding mathematician, took on and in 1864 the electromagnetism was born. Our life changed two centuries ago for good, thanks to the revolutionary discoveries of these two men.

Fast forward to 2020. My first paper aimed at the physics of the brain ([January 1990](#)) did not attract any attention. I suggested the broadest form of relativistic causality, called *biocausality*, and a new field called *causal field* (p. 6 in [Gravitational Energy](#)), which also can be stretched '[across a vacuum](#)'. Here am not indulging in metaphysics either. The Platonic theory of spacetime (p. 9) is grounded on indisputable and *widely* known facts. No need to present my own experiments, like [Michael Faraday](#) did, to convince the present-day community of physicists. For example, the groundbreaking discovery by Charles Wilson in 1911. I was trying to get in touch with CERN for nearly three years, arguing that they need to reexamine the so-called [Higgs boson](#), because they have missed an essential element of Nature: read the **bold facts** in p. 18 in [Can Geometry Produce Work](#). And what happened? The talibans at CERN blocked my email address due to "[phishing attacks](#)". I have never made any phishing attack, of course. They just lied. They may look quite civilized, but are in fact talibans. [CERN talibans](#).

The talibans at [LIGO](#) are a bit different breed, as they never responded to my email messages. Check out the tantalizing experiment proposed by LIGO's godfather at [p. 7](#).

The latest feedback to my *pre-geometric Platonic* theory of spacetime reached me eight years ago, from Prof. Dr. [Maurice de Gosson](#) at the University of Vienna: "Buzz off, idiot!" (Mon, 21 May 2012 18:47:46 +0200). That's it. I need [James Clerk Maxwell](#).

The task is strictly mathematical. On 21 September 2008, commemorating 100 years of Hermann Minkowski's lecture *Raum und Zeit* on 21 September 1908, I suggested two *modes* of spacetime: local (physical) and global (Platonic). The local mode is only the *necessary* condition for spacetime [continuum](#) endowed with causality and locality: "to exert an influence, something, such as a wave or particle, must travel through the space between the two points (Sic! - D.C.), carrying the influence" (p. 10). The global mode is the *sufficient* condition, because matter *alone* cannot make a spacetime. To quote [Piotr Chrusciel](#), "*space-time* is a time-orientable Lorentzian manifold on which a time-orientation has been chosen". But by **what**? It is not enough to have only "a wave or particle" (p. 10). The waves and particles belong to the *local* (physical) mode of spacetime, whereas the [global \(Platonic\) mode](#) is the complementary *sufficient* condition for spacetime. Matter alone [cannot do the job](#). We need [new physics](#). Once we unravel the [hyperimaginary numbers](#), the world will **change**: p. 8 in [GW150914](#).

D. Chakalov

21 July 2020

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