

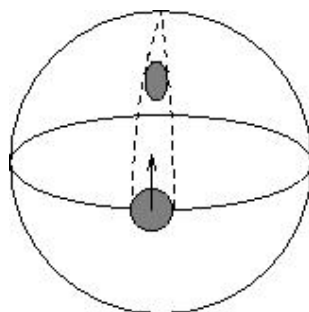
Can geometry produce work?

GR textbooks begin with a “massive body” ([Wikipedia](#)) that *somehow*, and for some unknown reason, would create particular [influence](#) in *non-flat* 4D spacetime (watch the clip [below](#)), 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.

Can non-tensorial [Christoffel symbols](#) produce **work**? What kind of “[influence](#)” is that? It doesn’t look like [electromagnetism](#). All we know for sure is that gravity can alter the [rate of time](#), as demonstrated in [GPS navigation](#) and [time dilation](#). But the *rate* of time ([W.G. Unruh](#)) cannot produce **work** either. If it could, it will be *physical* entity.

Let’s read the experts in GR. Quote from John Baez and Emory Bunn, [The Meaning of Einstein’s Equation](#), January 4, 2006, Sec. [Spatial Curvature](#):

“On a positively curved surface such as a sphere, initially parallel lines converge towards one another. The same thing happens in the three-dimensional space of the Einstein static universe (cf. [Einstein 1918](#) and [Hubble](#) - D.C.). In fact, the geometry of space in this model is that of a 3-sphere. This picture illustrates what happens:



“One dimension is suppressed in this picture, so the two-dimensional spherical surface shown represents the three-dimensional universe. The small shaded circle on the surface represents our tiny sphere of test particles (say, an [apple](#) - D.C.), which starts at the equator and moves north. The sides of the sphere approach each other along the dashed geodesics, so the sphere *shrinks* (emphasis mine - D.C.) in the transverse direction, although its diameter in the direction of motion does not change.”

This last sentence may sound comprehensible only to my [dog](#). I can certainly see that “the sphere shrinks” in the drawing above, but the ‘shrinking’ *itself* cannot produce **work**. Apples are *physical* objects, not some fictitious “[vacuum](#)” devoid of matter. Let me offer an explanation of the question posed in the title.

Consider two kitchen scales, A and B, on a table at rest, and two apples on them, with different weight, say, an apple with 200g on scale A, and another apple with 400g on scale B. How would you relate their “[trajectories](#)” in 4D spacetime to the non-tensorial [Christoffel symbols](#), so that the latter will produce different **weight**?

Obviously, an apple with weight 400g will resist [acceleration](#) *harder* than 200g apple. Obviously, *something* is doing work by pressing the scales A and B on the table.

What is it?

If you can answer this question in [the framework of GR](#), you may discover the coupling of geometry to matter sought by [Felix Klein](#), [David Hilbert](#), and [Hermann Weyl](#), among many others. Also, you might (eventually) *vindicate* the claim by [Kip Thorne](#) and his [LIGO collaborators](#) about their “discovery” of so-called GW150914 (p. 13 in [Zenon](#)). You might also qualify for Nobel Prize for your astounding discovery of [renormalizable](#) perturbative quantum gravity based on “gravitons” with mass $m_g \leq 7.7 \times 10^{-23} \text{ eV}/c^2$: see the ground-breaking experiment proposed by Kip Thorne at p. 24 in [BCCP](#). Good luck.

If you cannot answer the question, read [Über Die Gravitationsfeldrelativitätstheorie](#). In a nutshell, gravity can produce [enormous work](#) (for example, [Earth tides](#)), but we need first to explain why we observe only one “charge” with [positive](#) energy density. This is totally unexplained puzzle, and theoretical physicists talk only about ‘positive mass conjecture’ (references are available upon request). The idea suggested in [GTR](#) is very simple: recall QM operators (*ibid.*, p. 7). They are *not* geometric points. They take some stuff, denoted **P**, at the input and convert it into *another* stuff Q at the output. The latter becomes *physical* stuff (Q), which is ‘geometric point’ that can be located at the apex of the [light cone](#). But **P** (from [Plato](#)) is *not* on the [light cone](#). We observe only Q-stuff, with [positive](#) energy density only. So, QM operators act $P \rightarrow Q$.

For comparison, consider another operator from particular pattern (Gesetzmäßigkeit): if I gently stroke [Linda’s head](#) (L), she will wave her tail (Q): $L \rightarrow Q$. In this case, I can track the entire sequence of events in $L \rightarrow Q$ with light. Not so in QM: **P** is *physically unobservable* (pp. 6-7 in [BCCP](#)), as we know since 1935, thanks to [Erwin Schrödinger](#).

The *origin* of gravity is also $P \rightarrow Q$, because again we observe only Q-stuff, once at a time, as recorded with a physical clock: read [A4](#) on p. 4 in [GTR](#). Namely, the [Platonic](#) origin of quantum gravity (**P**) does *not* live on the [light cone](#). We can see with light only its waving *tail* (Q). People claim that the [trajectory](#) of the *physicalized* tail implies some non-flat 4D spacetime (watch the clip [below](#)). But we cannot see our Linda (**P**). She has *already* disappeared at the very instant of observation, just like [Macavity](#). See Escher’s ‘[drawing hands](#)’ and my note on the spacetime interval [here](#).

To sum up, the *origin* of gravity (**P**), called also ‘[John](#)’, does *not* act on any physical stuff. What actually acts on the physical world is the *physicalized* ‘[John’s jacket](#)’ (Q). And since in $P \rightarrow Q$ the former is *physically absent*, the latter (Q) becomes *self-acting*, like your [brain](#). Hence the *origin* of classical gravity (**P**) is *not* physical field, [but Q is](#). Yet Q only *facilitates* the Platonic origin of gravity (**P**), like a [hand](#) in [4D glove](#) (Q).

Moreover, [GTR](#) offers the path to quantum gravity from the outset: read my endnote [here](#) and pp. 2-4 in [Gravitational Energy](#), and notice the Heraclitean *flow* of events (recall the puzzle [above](#)) depicted with the vector **W** in the drawing at p. 8 [therein](#).

Needless to say, Einstein was fully aware of the problems in his General Relativity (see 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.

My theory is also [incomplete](#), firstly because “the total field (Gesamtfeld) of as yet unknown structure”, suggested by Plato many centuries ago (p. 9 in [BCCP](#)), lacks mathematical presentation: we need new [Mathematics](#). Read [NB](#) at p. 6 [below](#).

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[D. Chakalov](#)

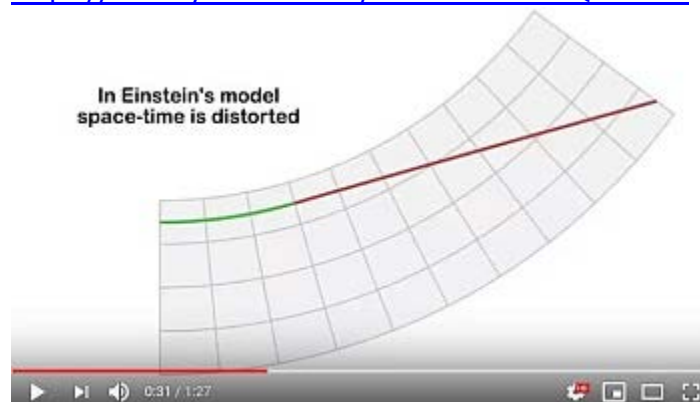
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Addendum 1

General Relativity: Einstein vs. Newton

<https://www.youtube.com/watch?v=DdC0QN6f3G4>



“In Einstein’s model space-time is distorted.” Fine. But there is no *explicit* time parameter τ in GR: read [Carlo Rovelli](#), [Bill Unruh](#), and [Charles Torre](#). Why? Because the Heraclitean *flow* of Time, shown with the **radius** of the ‘inflating balloon’ ([Hubble](#)), is missing in [Einstein’s equations](#). The misleading drawing by John Baez and Emory Bunn [above](#) shows “Einstein static universe” from 1918 **without** the crucial *unphysical* inflating **radius**.

We read that “space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve.” (J.A. Wheeler, p. 1 in [Gravitational Energy](#).)

Fine. But which goes **first**? Space acting on matter (telling it how to move) or matter acting on space (telling it how to “curve”)? See again Escher’s ‘[drawing hands](#)’ and my note on the spacetime interval Δs^2 (R.M. Wald, Ch. 11, p. 286) [here](#). Simple, isn’t it?

In [GTR](#), the statement by J.A. Wheeler [above](#) is amended as follows:

Spacetime acts on matter, telling it how to move-and-rotate. At the same instant, matter acts back on spacetime, telling it how to *alter* the rate of Time in the invariant spacetime interval Δs^2 .

Namely, the local *deflation* of Δs^2 creates attractive gravity, like going from Bob (B) to Alice (A), and the local *inflation* of Δs^2 creates repulsive gravity, like going from Bob (B) to Carol (C): p. 12 in [GTR](#) and p. 2 above. See the 'general rule' ($1 + 0 = 1$) in p. 2 in [Gravitational Energy](#) and the 'atom of geometry' at p. 7 therein, shown below.



The Platonic hand (P) in 4D glove (Q).
Examples from QM in [The Physics of Life](#).

The arrow of Time *cannot* be modeled with *temporal orientability* of spacetime: see the enormous smashing errors by Robert Geroch and Gary T. Horowitz in 1979 [here](#). The *orientability* of 3D space by "a choice of spatial parity" ("left-handed and right-handed triads", *ibid.*) is also false. The fact that in 3D space we can invert 2D *left* rubber glove into its mirror image of 2D *right* rubber glove (parity inversion) does *not* represent the fundamental *asymmetry* in spacetime topology: time reversal symmetry ($t \Leftrightarrow -t$) and left glove \Leftrightarrow right glove symmetry (parity inversion) do *not* model the fundamental *asymmetry* along the 3D "axis" of [Small and Large](#). That is, if you have a large 3D ball in front of you, you cannot "invert" it *inside-out*, so that you will wind up *inside* the ball. Do you know how mathematicians would catch a lion in Sahara? Check out p. 19 in [Hyperimaginary Numbers](#) and Mark Armstrong at p. 26 in [BCCP](#). The non-trivial topology of spacetime is a big can of worms, which has been quietly swept under the carpet by the established mathematicians and theoretical physicists.

Further information on [the flow of Time](#) is available to qualified individuals: read the last paragraph of p. 15 in [Über Die Gravitationsfeldrelativitätstheorie](#).

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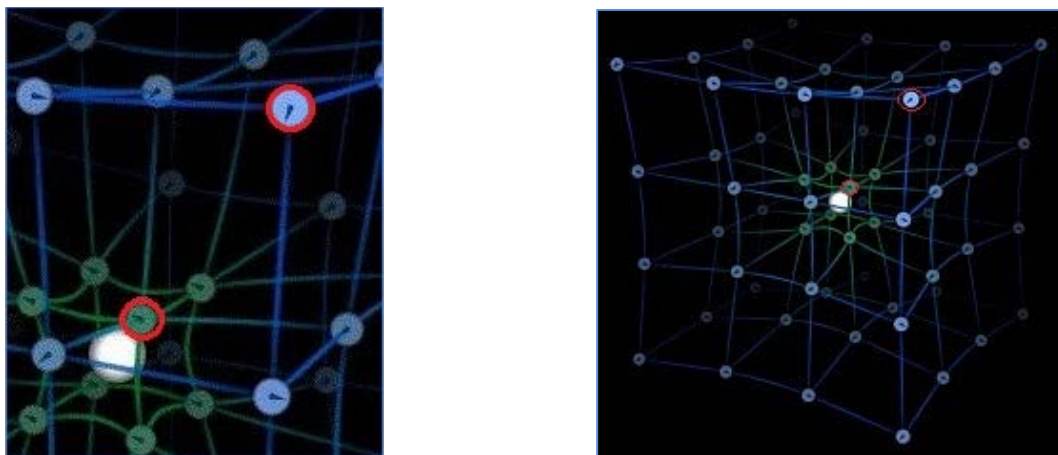
D. Chakalov

24 March 2020

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Addendum 2

This is what we know about [gravity](#): read [William G. Unruh](#) and compare the local *rates* of time read by the two (highlighted) clocks in the animation ([time.gif](#)) below.



Read the principle of GTR at p. 4 [above](#). There is no *explicit* time parameter τ in GR: read [Carlo Rovelli](#) and [Charles Torre](#), as well as Adam Helfer, Mihaela Iftime, and my comments at p. 4 in [The Atemporal Platonic World](#). The latter is always **nullified** in the *squared* spacetime interval Δs^2 (R.M. Wald, Ch. 11, p. 286): click [here](#). If it were possible to “discover” a *local* expression for gravitational field energy density (*ibid.*), the gravitational field will be local tensorial observable (L. Szabados and MTW p. 467) and gravity will become a *classical force field*. Therefore, GR cannot be a *bonafide* classical theory. But it cannot be quantum theory either. We need [quantum gravity](#). We need [Mathematics](#).

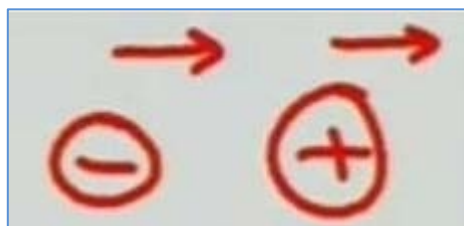
More in [Über Die Gravitationsfeldrelativitätstheorie](#) and [Gravitational Energy](#). There are *two* classical limits in quantum gravity, depending on the “direction” taken from the [macroscopic world](#) (denoted **B**) along the 3D “axis”, toward the [Small or the Large](#) (p. 12 in [GTR](#)): (i) from Alice (**A**) to Bob (**B**), and (ii) from Carol (**C**) to Bob (**B**). At the first classical limit (i), the nonlocal effects from the quantum world are FAPP zero; for example, in the effect discovered by [Charles Wilson](#). At the second classical limit (ii), the nonlocal effects from [large-scale gravity](#) are also FAPP zero. That is, the *physicalized* effects facilitated (Sic!) by the “glove” (**Q**), as explained with **P** \rightarrow **Q** at p. 2 [above](#), do not lead to any “anomalous” **Q**; for example, in [Earth tides](#). There is no violation of energy conservation by “[dark energy](#)” or by “[mystery matter](#)” at (ii): the phenomenon of **self-action**, exhibited also in the [human brain](#), is FAPP zero, too. With very few exceptions, people can use at (ii) only Newtonian gravity (e.g., [NASA](#)), and everything is sweet, because nobody dares to talk about [gravitational rotation](#).

Those interested in quantum gravity would eventually acknowledge that it would be “ferociously difficult” to understand the *emerging* of spacetime from ‘something else’ ([C.J. Isham and J. Butterfield](#)), although Plato suggested it many centuries ago (p. 2).

The latest feedback to my *pre-geometric Platonic theory of spacetime*, initiated in [July 1997](#), came 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. [Nothing else](#).

Regarding the topology of spacetime discussed at p. 4 [above](#): the 4+0 D spacetime, made exclusively by *physicalized* 4D 'jackets' Q (p. 2 [above](#)), has [simply connected](#) topology of *perfect* continuum, as it consists of one [asymptotically flat](#) ($\Omega_0=1$) 'piece' that does not have any "holes" denoted [P above](#). The intrinsic *dynamics* of spacetime topology is highly [non-trivial](#), as it also requires [hyperimaginary numbers](#). This is how we live in 4+0 D spacetime ($|w|^2 = 0$): read carefully pp. 3-4 in [Gravitational Energy](#).

NB: The new re-interpretation of the so-called negative mass (*ibid.*, p. 3) is *the* only possible path toward the explanation of universal [self-action](#). Nature does not put "positive and negative mass [side-by-side](#)", as Robert Nemiroff claimed at [YouTube](#).



Read Robert L. Forward at p. 13 in [Hyperimaginary Numbers](#) and the explanation in p. 3 [therein](#). It is not like [Baron Münchhausen](#). Newton's 3rd law is not valid here. The end result is *uncancelled* forces and [self-acceleration](#) by universal [self-action](#) of the *physicalized* world Q: see [P → Q](#) at p. 2 [above](#).

More in p. 16 in [GTR](#). To get you started, watch Flavian Glont arranging app. 43×10^{30} permutations of the Rubik Cube [blindfolded](#): at the end of the video clip posted [here](#), he finished with arranging the cube and then "looked" at it for nearly 2s. But he was still blindfolded, so what was he "looking" at? Watch Kyudo Master Ishikawa-san [here](#). This is Spacetime Engineering 101: see p. 6 in [Gravitational Energy](#).

We need advanced, large-scale effects of spacetime engineering. The best example is Anomalous Aerial Vehicle (p. 16 in [BCCP](#)), but first we need to know *much more* about gravity and gravitational rotation ([Richard Feynman](#)). Suppose, just for the sake of the argument, that one day some guy decides to fly over [River Thames](#) in London. Surely many tourists there will be fascinated (tourists love [free entertainment](#)), but will the current mathematicians and mathematical physicists become interested in [spacetime topology](#), the [origin of gravity](#), [general topology](#), [set theory](#), and [number theory](#) viz. [hyperimaginary numbers](#)? [When pigs fly](#).

Again, further information on [the flow of Time](#) is available to qualified individuals: read the last paragraph in p. 15 in [Über Die Gravitationsfeldrelativitätstheorie](#). Read also the story about the 'large yellow button' at p. 15 in [Hyperimaginary Numbers](#).

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