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:

![Diagram of a positively curved surface with two spheres moving towards each other](image)

“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 an 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.

Feel free to download the latest version of this paper from this http URL.

D. Chakalov  
20 March 2020  
Last update: 2 April 2020, 11:52 GMT

**Addendum 1**

**General Relativity: Einstein vs. Newton**  
[https://www.youtube.com/watch?v=DdC0QN6f3G4](https://www.youtube.com/watch?v=DdC0QN6f3G4)

“*In Einstein’s model space-time is distorted.*” Fine. But there is no explicit time parameter $\tau$ 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 $\Delta s^2$ (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:
Space-time acts on matter, telling it how to move-and-rotate. At the same instant, matter acts back on space-time, telling it how to alter the rate of Time in the invariant spacetime interval $\Delta s^2$.

Namely, the local deflation of $\Delta s^2$ creates attractive gravity, like going from Bob (B) to Alice (A), and the local inflation of $\Delta s^2$ 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 rubble 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.

Feel free to download the latest version of this paper from this http URL.

D. Chakalov
24 March 2020
Last update: 30 March 2020, 13:33 GMT
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 $\tau$ 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 $\Delta s^2$ (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: In my model of causality (dubbed biocausality, January 1990; p. 16-17 in Zenon), the atemporal Platonic world, denoted $P$ above, is exactly re-nullified: read here. Thus, we can observe only matter ($Q$) acting on itself ($Q$): the universal self-action.

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 $P \rightarrow Q$ at p. 2 above.

To understand how the universal self-action is implemented by your brain, try the experiment at p. 5 in Gravitational Energy. Also, watch Flavian Glont arranging $10^{30}$ 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: read p. 6 in Gravitational Energy and p. 16 in GTR.

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 what is the chance for the established mathematicians and theoretical physicists to become interested in spacetime topology, the origin of gravity, general topology, set theory, and number theory viz. hyperimaginary numbers (pp. 22-23 in BCCP)? 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.
Download the latest version of this paper from this http URL.

D. Chakalov
27 March 2020
Last update: 4 April 2020, 12:32 GMT