Gravitational Wave Parapsychology

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Abstract

After analyzing the 'intuitively obvious' assumptions about the propagation of strong non-linear gravitational waves (GWs), adopted by Kip Thorne and his LIGO collaborators, it is concluded beyond any doubt that the alleged "first direct detection of gravitational waves and the first observation of a binary black hole merger" (arXiv:1602.03837), announced on 11 February 2016, are **absurd**. You can't detect pink unicorns dancing with red herrings.

1. Preliminaries

It is well known that general relativity (GR) is essentially incomplete, as acknowledged by Albert Einstein:[1]

> 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 of as yet unknown structure.

The core unsolved issue, ever since the inception of GR in November 1915, is the absence of "mutual action of gravitational fields ***on*** matter".[2] As an analogy, the *shape* of a mountain is determined by the mountain, but there is no 'mutual action' by the shape *itself* on its mountain. All efforts to find some *local* gravitational energy-momentum[3] have failed miserably. To the best of my knowledge, we do not have any non-local and non-linear theory of gravitational radiation, from which one can calculate some 'weak limit' and suggest 'linearized approximation' of the initial strong non-linear GWs.

Thus, the alleged "direct detection" of *very* weak GWs by Kip Thorne and his LIGO collaborators (11 February 2016) is based on wishful thinking only. You can't detect pink unicorns dancing with red herrings.

This is the crux of GW parapsychology (GWP), plain and simple.

Let's move to the bold facts related to the so-called GW150914.[4] In the next section, I will examine the unsolved issues with the '*intangible*'[5] gravitational energy. In Sec. 3 and Sec. 4, I will focus on the facts about "gravitons" (Kip Thorne) and the hypothetical "polarization" of GW fields, and will address the indisputable astronomical observation on 17 August 2017: yes, the transport of energy by the genuine gravitational radiation (not by GWs) is a bold fact. Kip Thorne and his LIGO collaborators have not suggested any coupling (if any) of their "gravitons" to EM field. We do not accept GW parapsychology.

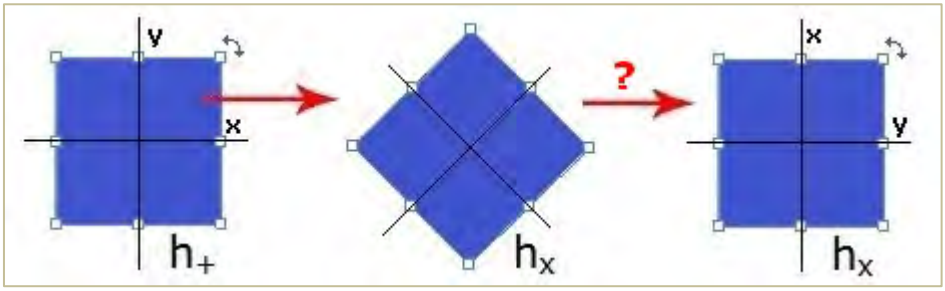
Finally, I will offer my personal, and perhaps strongly biased, opinion on the *gravitalized* (Sec. 4) mass-energy of the genuine gravitational radiation (not GWs), which can perhaps replace the zero-point "dark energy".[8]

2. Gravitational Energy

In the theory of relativity, energy is *always* localized[5] and our first off task is to unravel the correct mathematical presentation of '*local* gravitational energy-momentum'[3]. We read in Wikipedia[4] that "events in the cosmos would cause "ripples" in space-time — distortions of space-time itself — which would spread outward", and that "objects moving in an orbit would lose energy for this reason (a consequence of the law of conservation of energy), as some energy would be given off as gravitational waves". But once the energy *from* gravity is added to any gravitating system, the total energy cannot be "conserved" in principle.[6] Therefore, Kip Thorne and his collaborators cannot somehow 'remove' the inevitable vector (spin-1) and scalar (spin-0) polarizations[7] and the two "GW polarizations" (Kip Thorne) will conflate and intermingle like spaghetti bolognese. Sad but true. Why?

Because in GW parapsychology,[9] "the effect of each GW polarization is to contract fractionally the proper distance along one axis, while expanding it along the other (these axes being (x; y) for h_+, and axes rotated by **45º** with respect to (x; y) for h_x)." But what phenomenon could possible produce an **exact 45º angle** between h_+ and h_x (see the drawing below) and then keep it **exactly** fixed **within** the "superposition" of the two oscillating metric

fields (Kip Thorne), in such way that the latter will *never* conflate and intermingle? What could sustain the *phases*? Moreover, if the rotating angle reaches **90°**, the net effect from h_+ & h_x will be **zero**:



3. Gravitons (if any)

Assuming that "gravitons" are dispersed in vacuum like massive particles, Kip Thorne and his collaborators managed to calculate the "graviton mass" at $m_g \leq 7.7\times10^{-23}$ eV/c^2[10], but failed to explain how "massive gravitons" live in the quantum vacuum, and deliver their brand new quantum gravity. They also boldly declared that "in classical general relativity, a *vacuum* BBH merger does not produce any EM or particle emission whatsoever".[11] If so, it is completely unclear how these "gravitons" could unleash powerful EM radiation detected by 70 astronomical laboratories on 17 August 2017.

To produce "gravitons" that would create and support the tantalizing **45°** angle between h_+ and h_x in the drawing above, you should only wave rapidly your arms like a Hummingbird, as proposed by Kip Thorne:[12]

> 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?

Sadly, the exercise from Kip Thorne is not an April 1st joke. It is diagnose.

Do not ignore Albert Einstein (Sec. 1) and Sir Hermann Bondi.[5]

4. Gravitalized (not gravitational) energy

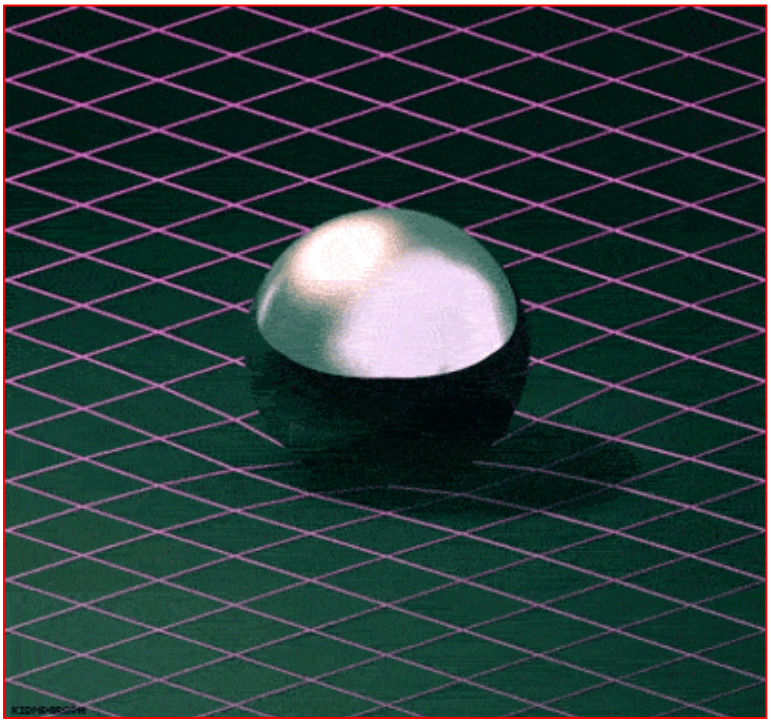
Robert Wald[13] raised the following question: “How may gravitational radiation be detected? If a gravitational wave passes through matter, the ripples in the space-time curvature will *induce* (emphasis mine - D.C.) stresses in the matter. If these extremely tiny stresses can be measured, one can detect gravitational waves.”

But how can the massless ‘shape’ *induce* stresses in its ‘mountain’ (Sec. 1)?

Piotr Chrusciel wrote in his *Lectures on Energy in General Relativity*:[14] “First, one expects that generic gravitating systems will emit gravitational waves. Detecting such waves requires a transfer of energy between the field and the detector, and to quantify such effects it is clearly useful to have a device that measures the energy carried away by the gravitational field. (...) The hunting season for an optimal definition of “quasi-local” energy is still open!”

But again, how can the massless ‘shape’ *induce* “quasi-local” stresses in its ‘mountain’ (Sec. 1)? The ‘shape’ itself is massless *geometry*, not a physical field.[3] The mantra ‘only matter interacts with matter’ leads to a nontrivial challenge.[2],[5],[6] We need new physics.[15] Here’s the puzzle.

The popular “explanation” of gravity deals only with attractive gravity, so once people observe a phenomenon that looks like *repulsive* gravity, they would simply call it “dark energy”, and get a Nobel Prize. But the idea of ‘attractive gravity’ is not simple and clear. Look at the trampoline below.

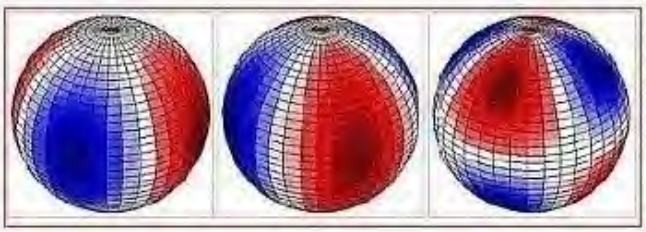


The *springiness* of the trampoline cannot be applied to the massless 'shape' of the 'mountain' (Sec. 1). The trampoline and the bouncing ball interact because they both are made of the physical stuff we believe understand and call 'positive mass', but we cannot "inject" it in the massless 'shape'.

According to GR, the attractive form of gravity is not a mundane force that pulls things together like a magnet, but a "consequence" of what physicists bravely call "space*time* curvature". And the more (positive) mass or (positive) energy the ball has, the more it will "bend" space*time* around it. This affects not only the motion of objects, but also the passage of time.

Go figure. For comparison, bosons and gluons in the standard model are considered "force carriers" and the fermions (leptons and quarks) are thought of as "matter". Similarly, what are the "force carriers" of gravity? Some (otherwise smart) people, like Kip Thorne, will vote for "gravitons".

To be on the same page, recall how the 'force carriers' of gravity pull up water in the oceans and the rocks underneath, creating Earth tides:



If GWs transport energy, they will be *physical* waves; if GWs *cannot* transport energy, they will be some parapsychological ghosts. This is the dilemma in GW parapsychology.

The Christoffel symbols cannot rotate the Earth *and* pull up↑ rocks.

We do not understand the gravitational rotation (Richard Feynman) either. Time for new physics, right? It is about Time.[15]

In my personal (and perhaps strongly biased) opinion, the only plausible path toward understanding the 'force carriers' of gravity and the zero-point "dark energy" is with the universal Fifth Force.[15] Any other ideas?

References and Notes

1. *Albert Einstein, Philosopher-Scientist*, ed. by Paul Arthur Schilpp. Tudor Publishing Company, 1951, p. 75.

2. Hans C. Ohanian, *Gravitation and Spacetime*, W.W. Norton & Company, 1976, p. 103.

3. Charles W. Misner, Kip S. Thorne, John Archibald Wheeler, *Gravitation*, W. H. Freeman, 1973, p. 467.

4. First observation of gravitational waves, Wikipedia. Retrieved on 2 June 2023.

5. Hermann Bondi, Conservation and Non-Conservation in General Relativity, *Proc. R. Soc. Lond*. A 427 (1990) 249-258, p. 249.

6. Hans C. Ohanian, The Energy-Momentum Tensor in General Relativity and in Alternative Theories of Gravitation, and the Gravitational vs. Inertial Mass, arXiv:1010.5557v2 [gr-qc], 28 Feb 2013. Quote from p. 3: In GR, the "geodesic motion can be shown to be a consequence of the "conservation" law for nongravitational matter. But this is really a *nonconservation* law — it reveals to what extent the energy-momentum of the nongravitational matter is *not* conserved."

7. LIGO Scientific collaboration and Virgo Collaboration, GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence, arXiv:1709.09660v3 [gr-qc], 13 Oct 2017, p. 141101-6:

"One of the key predictions of GR is that metric perturbations possess two tensor degrees of freedom [151,152]. These two are only a subset of the six independent modes allowed by generic metric theories of gravity, which may in principle predict any combination of tensor (spin-2), vector (spin-1), or scalar (spin-0) polarizations [11,12]. While it may be that any generic theory of gravity will be composed of a potential *mixture of polarization modes* (emphasis mine - D.C.), an investigation of this type is beyond the scope of this Letter."

8. Dimi Chakalov, Are Gravitational Waves Directly Observable? physics/0507133, 17 Jul 2005. Quote from the abstract: "Alternatively, a hypothetical case related to the so-called dark energy would render the task impossible in principle." Read more at p. 5 in facts.pdf. Regrettably, the talebans at arXiv.org deleted my manuscript without any explanation.

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Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2, arXiv:1706.01812v2 [gr-qc], 23 Oct 2018.

11. Kip S. Thorne *et al*., Localization and broadband follow-up of the gravitational-wave transient GW150914, arXiv:1602.08492v4 [astro-ph.HE], 21 Jul 2016.

12. Kip Thorne, *Gravitational Waves and Experimental Tests of General Relativity*, version 1227.1.K.pdf, 7 September 2012, pp. 31-32.

13. Robert M. Wald, *Space, Time, and Gravity*, University of Chicago Press, 1992, p. 120.

14. Piotr T. Chrusciel, *Lectures on Energy in General Relativity*, 22 February 2013, p. 3. Available online at this http ULR.

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