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The Hidden Ether of General Relativity

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Abstract: It will be shown that there must be a hidden Ether embedded within General Relativity and that such an effect would stipulate that Lorentz Invariance would seem to be broken at the quantum level, but it is not. I will also show how this accounts fully for the experimentally validated effect called entanglement.
Keywords: general relativity theory, aether, quantum theory.

To assume that the Integrand vanishes Einstein resorted to an empty space-time where the gravitational potential satisfies Laplace's equation. But, both modern QM and experiments like those with Casimir effects have shown the vacuum to be anything but empty.[1] This brings into question to issues, never fully resolved by GR (general relativity). Does the Integrand vanish and is there some underlining absolute reference frame of sorts.

The first question is easy to answer. The assumption about the integrand is derived from Newton's own equation for the universal law of gravitation. Both GR and Newton agree on this, as does our observational evidence to date.

To answer the second question I refer you to my prior article on the non-orientation of time.[2] In it, based upon experimental and observational evidence from Cosmology I proposed just such an absolute reference frame. It is an absolute reference frame of space that has no absolute time reference since the zero points have t=0. This would leave us with an ether of an absolute at rest space with no built in absolute time frame. This system lends itself to a scale variable C value that is not only in line with current observation; but would have automatically have given us a simple explanation for the accelerated expansion issue all along. Any such absolute frame of reference, like the zero points from the ZPF (zero point field) of Quantum Theory would constitute grounds for a timeless absolute reference frame. Any altering of scale from that absolute point would translate to a time orientation element's variance of C from it's maximal value simply since C would be an analytical function of its value at that zero point. Following Cauchy's Theorem, that value is only maximal at the singular point.[3]

The R's and T's of the Einstein field equation are covariant tensors of rank two, which means there are 4x4 set or 16 R's and T's and, therefore, 16 equations in General Relativity. Since these functions are symmetric in the indices, 6 of the equations with different indices are just repeats of the ones with the indices switched (e.g. R12 = R21, T12 = T21), so GR boils down to 10 equations. All of them are needed to describe gravity.

What recommended this set to Einstein, after struggling to find it between 1912 and 1915, is the general covariance keeping the same form with a large group of space-time coordinate transformations ability to express gravity as a space-time condition instead of a postulated force. The left side consists of space-time terms while the right side consists of given physical terms. This is because they expand to what are called Bianchi identities in Riemannian geometry. Therefore, the left side of the equations are zero due to math rather than physics. The right side of the equations are set to zero and this has actual physical significance. Some of which I have already mentioned above. What recommended this set to Einstein, after struggling to find it between 1912 and 1915, is the general covariance keeping the same form with a large group of space-time coordinate transformations ability to express gravity as a space-time condition instead of a postulated force. The left side consists of space-time terms while the right side consists of given physical terms. This is because they expand to what are called Bianchi identities in Riemannian geometry. Therefore, the left side of the equations are zero due to math rather than physics. The right side of the equations are set to zero and this has actual physical significance. The first integrals of relativistic mechanics, including conservation of momentum and energy, are in the right side. In his original theory, the potentials of Maxwell's theory occurred on the right side and therefore were not derivable from GR. Gravity alone gets the place of honor on the left side of the field equation set. The covariant divergence applied to the set of equations produces 4 sums that are identically zero. But the Maxwell equation that shows up in the right side is a post-Heaviside set. It is not the original Maxwell equation. In light of there being evidence for an ether of sorts within GR the question should be rightly addressed whether these post- Heaviside changes to Maxwell↕ s original equations ought to be reexamined. The present Lorentz-regauged Maxwell-Heaviside theory effectively assumes an inert vacuum which has been falsified for half a century by quantum mechanics and particle physics. It also assumes no curvatures of local space-time again falsified for nearly a century by general relativity. Since the active vacuum and the local curvature of space-time are the "active external environment" in which we utilize EM any aspect of that same vacuum which could be said to form any absolute reference would in fact automatically call into question the original logic behind both Heaviside and Lorentz's truncation of those equations. It's true any aspect abandoned by Heaviside that dwelt with an absolute time should be left removed. But absolute space reference frames can have implications.

If we consider the matter of gradients we find some odd things. Consider the gradient of gravitational potential, where potential is a scalar quantity. In math, the gradient of a scalar field is a unique, unambiguous thing. The gradient of a scalar field is a vector, not another scalar. An examination of quadeterions used by Maxwell will show we can exchange tensors for scalars and back again.

Another question we need to answer is if the field source begins to move, does the field gradient point toward the instantaneous or retarded position of the source? This is the crux of the gravity speed issue. If it points towards the instantaneous position then C is not a limit on velocity or information transfer since gravity waves would transfer information at least on mass. So the answer depends on whether the field updates or regenerates instantly or with delay. This raises a corollary of the causality principle which prohibits the prohibition of true action at a distance because every effect must have a *proximate* cause. That means that something (call it an agent), whether particle or wave or wavicle, must pass (or fail to pass) between a source of gravity and an accelerated target to produce the acceleration. Moreover, this agent is the carrier of the momentum transferred between source and target.

Some in GR have made the bold hypothesis: The space-time metric is not flat, as was assumed in special relativity. However, we have even a more unique problem if gravity is C limited. This would imply, since most gravitating bodies are in motion that for all objects the field gradient point toward the retarded. For fast objects this seems to be counter to current experiments:

1) a modern updating of the classical Laplace experiment based on the absence of any change in the angular momentum of the Earth's orbit (a necessary accompaniment of any propagation delay for gravity even in a static field);
2) an extension of this angular momentum argument to binary pulsars, showing that the position, velocity, *and acceleration* of each mass is anticipated in much less than the light-time between the masses;
3) a non-null three-body experiment involving solar eclipses in the Sun-Earth-Moon system, showing that optical and gravitational eclipses do not coincide;
4) planetary radar ranging data showing that the direction of Earth's gravitational acceleration toward the Sun does not coincide with the direction of arriving solar photons;
5) neutron interferometer experiments, showing a dependence of acceleration on mass, and therefore a violation of the weak equivalence principle (the geometric interpretation of gravitation);
6) the Walker-Dual experiment, showing in theory that changes in both gravitational and electrostatic fields propagate faster than the speed of light, *c*, a result reportedly given preliminary confirmation in a laboratory experiment.
7) An earlier laboratory experiment with summary description in L.J. Wang et al showed that charges respond to each other's instantaneous positions, and not to the left-behind potential hill, when they are accelerated.[4] This demonstrates that electrodynamic forces must likewise propagate at faster than the speed of light, more convincingly than earlier experiments shows angular momentum conservation.
8) A new laboratory experiment at the NEC Research Institute in Princeton claims to have achieved propagation speeds of 310 *c*. This supplements earlier quantum tunneling experiments. It is still debated whether these experiment types using electromagnetic radiation can truly send information faster than light.[5] Whatever the resolution of that matter, the leading edge of the transmission is an electromagnetic wave, and therefore always travels at the speed of light. However, such experiments have served to raise public consciousness about the faster-than-light-propagation concept.

Of all these experiments, #2 above -- the binary pulsars -- places the strongest lower limit to the speed of gravity to $2\text{x}10^{10}$ *c*.

In both the Newtonian and the GR equation of motion, all quantities take on their instantaneous values at any given time *t*. No one disputes that Newtonian gravity has infinite propagation speed built in. In GR, one of several ways to get equations of motion is to form a Hamiltonian (an expression for the total energy, potential plus kinetic, for a system of bodies), and take partial derivatives with respect to some chosen coordinates and momenta. In this crucial step for GR, the partials are always taken with respect to instantaneous, rather than retarded, coordinates and momenta, thereby neglecting aberration and implicitly adopting instantaneous gravity. Retarded values are not used because then the equations of motion would no longer conserve angular momentum which would be a major violation of known laws of physics and interesting enough would give some very incorrect answers under GR. To explicitly see the effect that a finite speed of gravity would have, just consider the case of a motion of a planet. So, any finding that the speed of gravity is exactly C will mean that GR is incorrect since it utilizes the instantaneous and not the retarded.

But what does this whole retarded/ instantaneous issue really point to? To get a partial answer on this let's examine Einstein's Layden speech on the Ether:

> *"It is true that Mach tried to avoid having to accept as real something which is not observable by endeavoring to substitute in mechanics a mean acceleration with reference to the totality of the masses in the universe in place of an acceleration with reference to absolute space. But inertial resistance opposed to relative acceleration of distant masses presupposes action at a distance; and as the modern physicist does not believe that he may accept this action at a distance, he comes back once more, if he follows Mach, to the ether, which has to serve as medium for the effects of inertia. But this conception of the ether to which we are led by Mach's way of thinking differs essentially from the ether as conceived by Newton, by Fresno, and by Lorentz. Mach's ether not only conditions the behavior of inert masses, but is also conditioned in its state by them."*

From this we gather that Einstein did presuppose an Ether of a different type within his Special/General Relativity theory. But how far did he really get to burying the old Ether Concept?

Going back to this retarded/ instantaneous issue we find that if one examines the following he only buried the absolute frame deeper within the math. If space-time is both 4 dimensional and contains embedded regions composed of a 4D frame in which the local value of C is not the same as in the combined solution then it would follow that:

- Locally 4D space-time is always orientatable.
- For a comparison on the two sub-space regions there will exist a path along which a consistent orientation cannot be defined.
- This makes the combined system non-orientatable because through every point there will exist a path for which no orientation can be defined.

Any experiment then that probed or utilized such a path would display non-locality. To validate the non-orientation of space in regards to time all we need is one example that focuses on some point R outside of the local orientation. Such an experiment does exist in the form of quantum entanglement. A photon, once entangled, can be moved to some point R outside of the lightcone of an event that transpires at a local point we shall call A and though after that event its normal light signal will have only reached point B, the event will effect our photon at the remote point of R. For this to take place some signal, non-orientatable to time in the usual 4D format must have taken place. This implies a

FTL condition for the signal to arrive at R. It also implies that at some fundamental level all points in space-time intersect with each other. If they intersect then time orientation does not exist at some fundamental level. Thus, any system of time orientation can only apply at the combined 4D space-time level or some manifold shy of the ultimate level of motion. Since that 4D level is known to be Lorentz invariant it must obey the confines of that system. Yet, those embedded sub-space manifolds will not follow that same Lorentz constraints. For the ultimate level of motion within that system since all points are connected there can be no absolute point of reference. However, in levels short of that point there can be an orientation which is itself a point of reference.

So all in all we find evidence from main avenues for an ether consisting of an absolute space and no time being the underlining fabric of space-time. The time orientation we do find displayed in nature is simply an altering of scale from that absolute point causing a variance of C from it's maximal value simply since C would be an analytical function of its value at that zero point. Following Cauchy's Theorem.[3]

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