Title: Newton's law of gravity and Einstein's fabric of spacetime
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The modeling of spacetime curvature works because it mirrors the actual situation of objects being forced into curved paths by massive bodies generating local gravitational fields and because Einstein chose a metric to ensure it reduced to Newton's law of gravity for flat spacetime and slow-moving bodies.

The curvature of spacetime is not needed to establish the equivalence principle, which is a very simple intuitive concept experimentally confirmed centuries ago by virtue of the sameness of measure of gravitational and inertial mass.

General relativity uses the equivalence principle; and its gravitational clock-slowing is expressed in a manner relative to an imaginary clock free of gravitational influence (a clock at infinite distance or in a higher dimension). That means that clock-slowing as described in general relativity is free from ambiguities; that is, the clock-slowing that is described is a reality in the sense that it involves an actual baseline rather than merely symmetrical perceptions of clock-slowing.

Specifically: Non-kinematical time-keeping as registered by entities is established by considering their gravitational potential in a real sense. Again, their non-kinematical clock-rates are relative to an imaginary clock free of gravitational influence, and the differences from that baseline are then used to compare the clock-rates of the entities to each other – just as we do for kinematical time-keeping in our absolute approach to special relativity.

That is the opposite of the approach Einstein used in his treatment of special relativity, where clock-rates are mere perceptions across inertial frames, rather than real magnitudes relative to a baseline (rest-state clock-rate in this case).

General relativity does allow for flat regions of space (or spacetime). Escape velocity is zero in that region in accordance with an object that is free of gravitational influence. One is left with only the kinematical clock-slowing of special relativity.

What is different about this from the standard accounts of special relativity is that in this case, the kinematical clock-slowing would be an actuality, rather than clock-slowing merely as perceived across inertial frames.

In the standard accounts of SR, the description of clock-rates associated with flat space continue to suffer from considering only symmetrically measured clock-slowing across inertial frames. Differences in clock-rates are considered merely a perception rather than as also something real; thus the time-keeping differential evident upon the reuniting of two clocks is not truly (rationally) explained in such a treatment. "Taking different paths through spacetime" is not a valid explanation.

In short, GR is logically consistent regarding clock-rates, whereas the typical interpretation of Einstein's 1905 treatment of SR – along with Minkowski flat spacetime – is logical fallacy regarding how a change of inertial motion affects kinematical clock-rates. Actual differences in clock-rates are not acknowledged, thus actual changes in clock-rates are not acknowledged. As merely one of countless examples: John A. Wheeler writes on page 76 in *Spacetime Physics*: "Does something about a clock really change when it moves? Absolutely not!" Wheeler confuses "symmetry of measure" with "no truth of the matter".

Recall that when calculating a time-keeping differential, one must combine the general relativity non-kinematical clock-rate-slowing with the kinematical clock-rate-slowing of special relativity. It would be absurd to think that we're combining a non-kinematical clock-slowing in real terms with a kinematical clock-slowing that is merely a perception existing between two entities.

Also recall that the absolute treatment of *special* relativity generates the results that the relative approach assumes, while also explaining the time-keeping differential and symmetry of measure across inertial frames. Regardless of the fact that Minkowski's flat spacetime was part of the inspiration for Einstein's approach to his theory of gravity, it does not address clock-rate changes due to a change in inertial motion, as it is dependent on Einstein's purely relative clock synchronization.

**Newton, general relavitity, and non-coincidences**

The sameness – to an endless degree of precision – of gravitational and inertial mass was for centuries regarded as a coincidence. That point of view should have always been regarded as nonsense. I certainly (and instantaneously) had regarded that point of view as nonsense before I was even aware that Einstein's general relativity incorporated the equivalence principle. We do not need a concept of objects following paths along geodesics to understand that gravity and acceleration by application of force undo each other and are indistinguishable from each other.

They never learn:

When Newton's law of gravity is combined with the equivalence principle and the simple kinematical clock-slowing of uniform motion, the resulting set of equations precisely match the GR Schwarzschild metric for gravitational clock-slowing associated with an actual gravitational force (versus an actual gravitational force *plus* a gravitational *effective* force); that is, the actual gravitational force of a *non-rotating* massive body versus the actual *plus effective* force of a *rotating* massive body. That is the new "coincidence".

To elaborate:

A *rotating* body generates a small amount of additional clock-slowing that is considered a gravitational field effect. The angular momentum and "frame dragging" involved is due to rotational inertial motion (which relates to a precession relative, ultimately, to totality). Thus, the effect is not considered the result of a true gravitational "force".

A brief aside:

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In fact, rotational inertial motion itself is considered to be generating a gravitational "effect" rather than a true gravitational "force", just as acceleration is not a true gravitational force.

The frame-dragging effect is modeled as additional curving in Einstein's fabric of spacetime and is considered analogous to a moving electric charge which produces magnetism. Magnetism, in fact, is also generated by inertial motion and is not regarded as a force independent of electricity. It all sounds suspiciously like quantum interference effects despite frame-dragging being a large-scale effect, such as regarding black holes.

I've always maintained that gravitational fields create quantum interference for electromagnetic transmission – causing both the slowing and bending of light rays due to energy lost to the field. Nothing else makes any sense. A photon would not be a photon if it gave up energy. Rather, there is absorption and emission of photons in the field. The slowing and bending is of course modeled as a curving of spacetime. Could they ever unify relativity and quantum mechanics while clinging to the spacetime model? Maybe.

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Newton plus equivalence principle plus inertial motion clock-slowing ==>

escape velocity (ev) = $(2GM/r)^{1/2}$ ==> GR dilation = $(1 - (ev/c)^2)^{1/2}$

That fact is currently considered to be a mathematical coincidence.

Not by me.

Einstein's choice of metric in general relativity was made with consideration of Newton's law of gravity. He knew that his field equations need to reduce to the Newtonian case in the absence of gravity.

GR: escape velocity > 0 SR: escape velocity = 0

General relativity succeeds because the Riemannian geometry of spacetime mirrors the actual situation of space and time as separate entities regarding gravitational clock-slowing. And, as indicated, the curvature of spacetime in general relativity describes clock-rates in relation to an actual baseline. Small wonder that it reduces to Newton's law of gravity.

Newton's law of gravity dictates that light, being composed of momentum-containing photons, will be forced to follow a curved path due to gravity. The difference – as I see it – in the predicted degree of measured curvature from Einstein's prediction is due to Newton not allowing for the fact that gravitational influence is established at the speed of light – rather than instantaneously – as an object of mass moves through a region.

That would also apply to the difference between Newton and Einstein in the precession of a planet's orbit.

I finally decided to see whether Einstein had anything to say about that; so I mashed through his general relativity paper and found the following:

“If we suppose the gravitational field to be quasi-static by confining ourselves to the case where the motion of the matter generating the field is slow – as opposed to the speed of light – we may neglect the right-hand side differentiations with respect to the time in comparison with those with respect to the space coordinates, so that we have [equation]. This is the equation of the material point according to Newton's law of gravity.”

Einstein's terminology is often ambiguous. He is either referring to what I was referring to or to a parallel consideration, even though his terminology doesn't exactly make sense for either case.

At any rate, I don't know that we must combine space and time-keeping into a four-dimensional fabric to make the allowance that I alluded to – that of gravitational fields themselves being established at the speed of light. Taking a space and time approach to formulating it might not be any more complicated than Einstein's monumentally complex spacetime approach.

Einstein's field equations predict all sorts of things (at least one them absurdly impossible – backward time-travel) that Newton's law of gravity / equivalence principle / special relativy (call it NES) doesn't explain, and that most people would likely say never could, no matter how much is added to it. The sum total of this article might explain why I think it is, in principle, rational to think that it could.

Black holes are indicated by Newton's law of gravity. Again, the differences in the particulars are accounted for by the fact that Newton did not allow for gravitational fields being established at the speed of light.

Gravitational waves would also be automatic in Newtonian gravity if Newton had considered that gravitational fields are established at the speed of light. Such waves are referred to as "ripples in spacetime" (deviously, no doubt, for the purpose of convincing us that spacetime is the physical reality rather than a geometrical modeling).

Gravitational lensing indicates the presence of dark matter, which is not unique to the spacetime model.

All the above – and anything else one could point to – arise from concepts that are not unique to the geometrical modeling of spacetime.

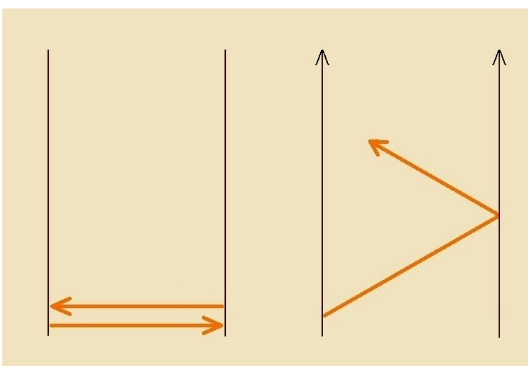
One thing no-one should doubt: The exact sameness of NES and GR non-kinematical clock-slowing is no coincidence.

Regardless of the above considerations, it is a happy thought that – unless one seeks unification with quantum mechanics – general relativity does not seem to be seriously in need of re-formulating, as it would take me minimally a thousand lifetimes to achieve what Einstein achieved, and even then I couldn't achieve it. Have you examined his mathematical treatment leading up to and including his field equations?

Again: When Newton's law of gravity is combined with the equivalence principle and the simple kinematical clock-slowing of uniform motion, the resulting set of equations precisely match Einstein's treatment for gravitational clock-slowing associated with a non-rotating massive body.

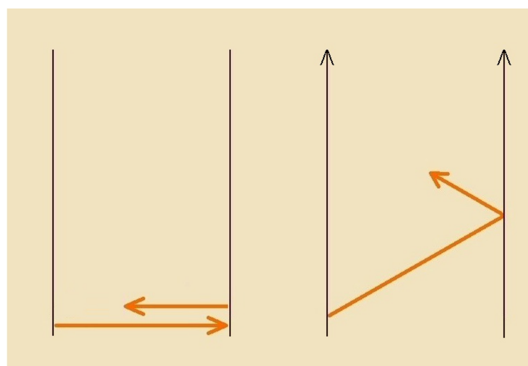
Diagram below:

Newton's law of gravity dictates the slowing of light. That, in conjunction with kinematical clock-rate slowing (which is dependent on the speed of light), yields the total clock-rate slowing.



at rest and no gravity — uniform linear motion and no gravity

kinematical only



at rest and gravity — uniform linear motion and gravity

kinematical plus non-kinematical

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