Title: Newton's law of gravity and Einstein's fabric of spacetime

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Author: Roger Luebeck 

Submit comments to: luebeck.roger@rogcad.com

The modeling of spacetime curvature works because it mirrors the actual situation of light being forced into a curved path by a massive body generating a local gravitational field 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 that was experimentally confirmed centuries ago by virtue of the equivalence of gravitational and inertial mass.

Newton's law of gravity can be used in conjunction with the equivalence principle and the inertial motion clock-slowing equation of special relativity to describe gravitational clock-slowing that is exactly equal to gravitational clock-slowing as we know it in general relativity using the Schwarzschild metric, which is the solution to Einstein's field equations for a non-rotating, spherically symmetric mass. That cannot be a coincidence.

GR also uses the equivalence principle, and its gravitational clock-slowing is expressed in a manner relative to a theoretical clock free of gravitational influence. That means that clock-slowing as described in general relativity is free from ambiguities; that is, the clock-slowing that is described is an absolute reality in the sense that it involves an actual baseline rather than merely measured clock-slowing between parties in different states of acceleration, in different gravitational fields, or even in different states of inertial motion (read this entire document).

Specifically: Time-keeping as registered by entities is established by considering their gravitational potential in absolute terms. As we said, their clock-rates are relative to a theoretical 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 an entity's inertial motion is considered only with respect to another entity, and not to a baseline (rest state in this case).

General relativity does allow for flat regions of space (spacetime). Escape velocity is zero in that region in accordance with a clock that is free of gravitational influence. Using the equivalence principle, one is left with only the kinematical clock-slowing of special relativity. Simple freshman physics.

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

In the standard accounts of special relativity, the description of kinematical clock-rates associated with flat space continue to suffer from mere measures of symmetrical clock-slowing in that flat space. The difference in clock-rates is considered a perception rather than as something real, and the time-keeping differential evident upon the reuniting of two clocks is not explained.

In short, GR is logically consistent regarding clock-rates, whereas the typical interpretation of Einstein's 1905 treatment of special relativity – 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.

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 absolute 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 of the relative approach 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 when there is 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 instantly) had regarded it as nonsense before I was even aware of general relativity and Einstein's equivalence principle. We do not need a concept of light following paths along geodesics to know that gravity and acceleration by application of force undo each other and are indistinguishable from each other.

They never learn. To repeat the paragraph from page one:

Newton's law of gravity can be used in conjunction with the equivalence principle and the inertial motion clock-slowing equation of special relativity to describe gravitational clock-slowing that is exactly equal to gravitational clock-slowing as we know it in general relativity using the Schwarzschild metric, which is the solution to Einstein's field equations for a non-rotating, spherically symmetric mass. That cannot be a coincidence.

Newton plus equivalence principle plus inertial motion clock-slowing:

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

Yet, 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 needed to reduce to the Newtonian case in the absence of gravity.

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

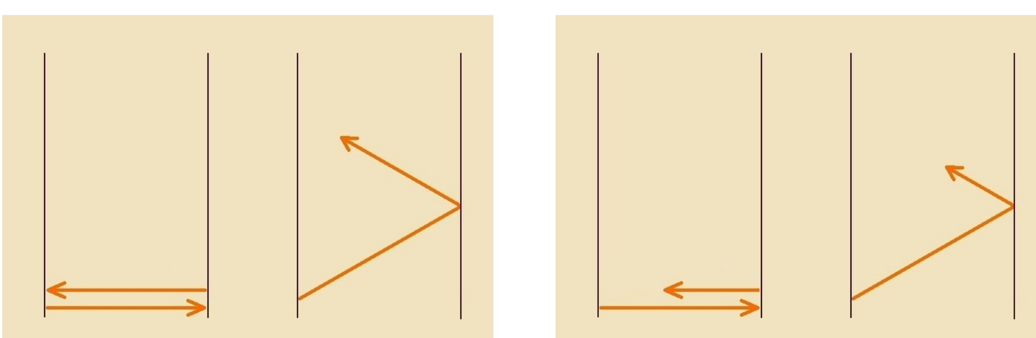
General relativity succeeds because the Riemannian geometry of spacetime mirrors the actual situation of space and time as separate entities regarding gravitational clock-slowing. And, as indicated, the curvature of spacetime in general relativity describes clock-rates in relation to an actual baseline.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

The main difference between Newton's law and Einstein's fabric of spacetime (where time is represented spatially) is that in Newton's model, there is no allowance for a "gravitational field" to change form at the speed of light as an object of mass moves through a region. But I don't know that we must combine space and time into a four-dimensional fabric to make such an allowance. Taking a space and time approach to formulating it might not be any more complicated than Einstein's spacetime approach – which reads as ad-hoc and forced at every turn. (And it is nearly all a foreign language to me.)

Einstein's field equations predict all sorts of things (at least one them absurdly impossible) which Newton's law of gravity / equivalence principle / special relativy (call it NES) doesn't explain, and everyone doubts ever could no matter how much is added to it.

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

In any case, it is a happy thought that general relativity does not seem to be 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 anyway. Have you examined his mathematical treatment leading up to and including his field equations?



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

kinematical only | kinematical plus non-kinematical

Above:  Newton's law of gravity dictates the slowing of light (which dictates clock-rates).

Combined with the simple kinematical clock-slowing of uniform motion and the equivalence principle, the resulting set of equations precisely match Einstein's treatment for gravitational clock-slowing associated with the gravitational field of a non-rotating massive body.

See sitemap for my other articles:

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Citation and annotation for the book *Relativity Trail*