

“SLIDE-FORWARD RECESSION” : EINSTEIN’S MAIN FINDING PROVES EVEN STRONGER

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Abstract

The oldest gravitational idea of Einstein is by the use of a toy model shown to be still more powerful: It implies c -global. This new fact if true is decisive for the unification of physics.

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Introduction

Remember how Einstein predicted gravitational redshift – the fact that our clocks tick slower than those in the satellites overhead – ? He invented the toy model of a constantly accelerating long rocketship in outer space, Jules-Verne style. The bottom of the rocketship appears to be falling back constantly without falling back: this an upwards sent light ray will reveal, Einstein claimed [1]. For during the time the ray is ascending towards the tip, the tip picks up additional speed, and is hence receding from the emission point when the light ray from below arrives. This was Einstein’s most alien finding among his many unprecedented hits.

The combined falling-back and staying-put of the bottom, valid relative to the tip, almost overtaxes the imagination. Therefore an attempt at building an analog model appears justified. The behavior of light along a transverse cut through the bottom of the Einstein rocketship can be modeled as follows:

A long cylindrical barrel rotating about a horizontal axis is mounted in close parallel to a thin vertical wall endowed with a narrow horizontal slit through which one can watch the surface of the barrel as it almost touches the slit over its whole length. As the barrel is turning, its visible surface is moving downwards across the slit. Next, light pulses are assumed to be generated on the surface of the barrel right behind the slit, to be sent off, either vertically or horizontally along the middle of the slit.

First the vertical case: Here the constant downwards rotation of the surface of the barrel causes the ascending light ray to be redshifted on its arrival at a detector higher-up on the vertical wall. This case models gravitational redshift. Note that the phenomenon arises even though the barrel itself (“the bottom”) stays fixed. The downwards rotation replaces Einstein’s falling-back. I apologize for the naiveté of the model of the bottom of the Einstein rocketship. The vertical case stands not alone.

Second the horizontal case: If the barrel did not rotate, the track the horizontal light ray is generating on the surface of the barrel would be strictly horizontal. However, since the barrel is rotating, its surface is moving downwards inside the horizontal viewing slit as we saw. Hence the horizontal light path visible in the viewing slit does in reality trace out a light path of constant slant on the surface of the rotating barrel. This upwards slanted path is part of a flat coil that is curling leftwards around the barrel when the latter is assumed long enough. Viewed through the slit or from above, the light ray – moving in a groove, say, on the surface of the cylinder – looks both horizontal and reduced in its speed ($c' < c$). However, on the barrel itself, the light ray is slanted and non-reduced in its speed ($c' \equiv c$). So the speed reduction observed from above is only an apparent one.

This finishes the presentation of the “barrel model of gravitational redshift.” The Einstein equivalence principle suddenly looks much more complicated. However, the horizontal-appearing light path hugging the floor of the Einstein rocketship can now be appreciated better. The reduced speed seen through the slit reproduces the reality Einstein saw in his founding paper: the light ray watched from above looks reduced in speed by the redshift factor [1]. But the same light ray is actually tilted and as such unreduced in its speed. This the model brings to the fore. Thus the axiom that c is a global constant (which co-defines the equivalence principle which is based on special relativity) is no longer violated in the equivalence principle. Inside the rocketship the floor-hugging light ray is locally slanted everywhere in a gently upwards-tilted manner with its canonical speed c .

Rehabilitation of the speed of light in the vacuum, c , in the equivalence principle is implicit. This new finding explains in retrospect why Einstein next fell into a baffling silence regarding the topic of gravitation for 3 ½ years (until mid-1911 [2]). He likely would have embraced the above extension of the backwards falling property of the bottom seen by him, from vertical towards lateral light rays.

The barrel model, however, comes 107 years late. During that long time, the ingrained conviction of the scientific community that c is no longer a global – only a local – constant in the vacuum has crystallized into a fixed textbook teaching. General relativity supports this view. So do many derived implications, ranging from cosmic space expansion to black hole

evaporation. These later notions are part and parcel of the living consciousness of most every earthling to date. The sudden need to “re-scale” the Einstein equation so as to accommodate c-global is therefore likely not to be seen as a chance but rather as a threat. This is the automatic consequence of 107 years of “life without c-global” (to paraphrase Vicco von Bulow’s famous saying about his pug [3]).

The toy model of the constantly receding bottom invented by Einstein in 1907 [1] got complemented above by a “reduced toy model” – the constantly rotating barrel. This “analogical transposition” of an idea of Einstein is either inadmissible or convincing. I do not dare anticipate the eventual verdict. However, the so arrived at suggestion to “just for the fun of it” write down a global-c transform of general relativity to see whether it proves compatible with quantum mechanics (as the hoped-for holy grail of modern physics) is legitimate. No greater progress is currently conceivable.

To conclude, tinkering a bit in a remote corner of the history of science is an allowed pastime for aficionados. I once came across the paradoxical chaos-theoretic notion of a “snap-back repeller” invented by Fred Marotto [4]: this is how the title of the present note arose. In either case: chaos theory and gravitation theory, there is no mystery – only awe.

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References:

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