False Equivalence of Accelerating Rocket and Gravity Pull on Elevator

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Abstract
Gravity bends a light beam more than a particle beam. So, this article tells elevator occupants how to use that fact to detect whether the forces they feel are caused by a gravitational or **non**-gravitational acceleration. I.e., although that capability supposedly violates the 'Equivalence principle' of 'General Relativity'. Einstein imagined "the experiences of occupants in a windowless chamber, in deep, isolated space" as it was 'accelerated upward' by a pulling. And claimed 'Equivalent' (identical) feelings and test results would arise for occupants in a non-moving elevator on our gravitational earth.[1] Yet, let us imagine that a photon and an ultra-high-speed particle are launched at the same time from an internal wall of an elevator; then they go through two adjacent pin-holes, and finally hit the opposite wall. But surprisingly, they do not hit the same spot - because the gravity bends photons twice as much as a particle beam.[2] But not so - for a rocket in deep outer space, experiencing a non-gravitational acceleration! So we discuss that violation of 'Equivalence in Relativity' and its broad implications, in this article.

Introduction
It might seem, as Einstein believed, that our 'windowless' elevator occupants can't overcome the limitations imposed by the "Gravitation-Acceleration Equivalence Principle'. I.e., that an astronaut in a windowless accelerating rocket far from earth – could not tell that from, instead, his being in an unmoving elevator on earth, with earth's gravity. But we use the results and implications of the great "Einstein-Eddington Gravitational 'light-bending' observation," to successfully show and uncover subtle distinctions between 'gravity' and 'other causes' of acceleration. And thus how the occupants can 'run a test' to tell the difference. Many scientists believe that that 'Einstein-Eddington Bending light experiment' was among the few most important experiments and results ever accomplished, and perhaps the greatest.[3] So, let's use it!

Discussion and Details
To help grasp some of its implications, let us compare two situations, as follows:

Suppose we were to launch a particle in a straight horizontal path at a high-speed almost exactly equal to the speed of light 'c', as previously mentioned. That would mean that the particle mass, (somewhat like the protons in the 'super-collider' Higgs research), would reach speeds of nearly 'c', i.e., 99.9999991% of the speed of light. In fact, we can imagine even a pinch faster, if helpful in our 'Thought-Experiment", in this article.

So our imagined particles would have such great relativistic mass and energies as to be very comparable to the very massive Higgs Boson. [4] And we can even imagine a pinch greater mass, if that enhances our 'thought-experiment. But, here, to make our point with simplicity, we can imagine a high-speed race between such proton and photon, i.e., 'racing' from one internal elevator wall to the opposite wall. And importantly, that they would hit the target wall at almost exactly the same time, i.e., ideally, both hitting so close to 'the same instant' that any time difference would be indistinguishable. And that would simplify our seeing the correctness of our conclusions. I.e., the different results from gravitational vs. non-gravitational accelerations.

(Although there is a so-called 'large relativistic increase' in the mass of the 'gross particle', when traveling at nearly 'c' speed, compared to it 'rest mass', we also note this: The gravitational force on the great 'relativistic mass' is also proportionally increased. So the resultant 'downward-acceleration' on our imagined mass particle is not increased by its velocity-related increased 'relativistic mass' compared to its lesser 'rest mass' or 'slow-moving' mass.)

To more easily grasp my point, suppose our elevator was speedily traveling parallel to the surface of a super-massive neutron star, and 30 miles above the neutron star's surface. The 'downward pull' of gravity on it would be great, indeed. And quite enough to cause a very clear and great difference in the bending of the photon path vs. the particle's path – and thus that difference could be easily imagined and measured.[5]

So by comparison, the difference in paths, between the photon and gross particle would be so great as to dwarf, in magnitude, the minor effect of our "flying particle's speed", being a virtually 'undetectable' pinch less than the photon's speed, 'c'. I.e., even though the particle hit the 'target wall' a pinch after the photon. Thus, we can validly imagine that, as our basic laboratory equipment came closer and closer to super-capability and 'ideal perfection', -- that our experimental outcome and its description would become more and more easily visible, clear, and irrefutable!

So even for a less extreme gravitational case than above, we would note this: After passing through the close 'side-by-side' adjacent 'pinholes', there would be a very definite difference between where the photon hit the wall, vs. where the gross particle hit the wall. I.e., the 'photon would hit the wall well-below the gross particle'. And that great landing difference would clearly reveal that a 'gravitational acceleration' was in action, here, and **not** a '**non**-gravitational acceleration' And thus, the General Relativity alleged Equivalency Principle is, here, violated!

Optionally, we might note that, in all of the above, we are NOT seeking some 'superficial factor' or 'frivolous artifact' as a cause of producing a different experimental result than as predicted by the 'Relativistic Equivalence Principle' For example, the superficial 'very slight difference in gravity' existing between the upper and lower regions of our elevator.

Those ‘superficial imperfections’ only distract us away from our far more important fundamental, subtle basic inherent factors and considerations, even though our effects may be small. I.e., the factors and considerations that we considered would, indeed, cause the ‘Elevator-gravity-acceleration equivalence principle’ to fail -- under the special and important circumstances which we described. I.e., even though our special circumstances would be a rarity. And, of course, the finer our equipment and instruments, the clearer our results, instead of ‘less-clear’ – because our considerations are so basic, not ‘superficial.

OPTIONAL , Additional Related Discussion and Miscellaneous

I do NOT think that there is only one major exception to what is generally held to be ‘the 100% flawless’ aspects of ‘General Relativity Theory’. But, rather, I think that several aspects of ‘General Relativity Theory’ are occasionally violated by special ‘exceptional circumstances and considerations.’ And the ‘Special’ and the ‘General’ Relativity Theories also have some ‘ambiguities’, that thus invite and receive differing interpretations from experts. But I still think many aspects of General Relativity ‘hold good’, and remain helpful, useful, and admirable.

And there is not enough space in this intendedly short paper to discuss several aspects of General Relativity for which exceptions arise, nor the details of the exceptions. Nor space to discuss some other fine scientists, who sometimes step out of the ‘mainstream’, by having their own ‘list of exceptions’ to ‘General Relativity Theory’. (And, incidentally, even as of my paper’s date, there are also a few other scientists, ‘on-the-net’, who also believe that Einstein’s Equivalence Principle does have some minor exceptions. But I think my examples are more basic.)

So I will try, here, to just outline what I regard as a few more ‘exceptions’ – important exceptions, at least to some aspects or implication of General Relativity, although one will be a sort of ‘statistical’ criticism, in nature. (And after that and separately – I’ll also describe some ambiguities arising in Special and General Relativities.)

1… Let us suppose that an observer was in a rocket that was travelling at, say, half the speed of ‘light’, ‘c’. And that he viewed every major star, both in front and in back of him. And with a good telescope. He would see that the light from the stars in front of him was clearly shifted ‘more-toward the blue’, (ultra-violet). And the light from stars in back of him – clearly shifted more to the ‘red’, (infra-red). And he would conclude, invariably or almost invariably, correctly -- that he was very likely ‘absolutely’ travelling in the ‘blue-shifted’ direction, relative to the massive universe. And thus, I think he would correctly dispute the position held by most scientists’ view of ‘Relativity’ – i.e., that no one can correctly claim that they are the one ‘linearly’ moving, and that the other person or body is ‘more stationary’.

2… And somewhat similar to the example above, let us suppose that our ultra-fast travelling rocketeer held up a double-faced ‘scoop or particle gatherer’ – after initially aiming his rocket route away from any star. He would likely discover over an extremely long time-span and distance travelled – that he had ‘scooped-up’ (detected) more particles (such as ‘cosmic-rays’ and

noted them hitting harder), in the direction that he was travelling at his ultra-high speed. That is -- compared to 'from the 'opposite direction'. 'And so on' . . . . much like in the previous example!

3…Suppose that a scientist used an 'at rest', small detector, which used 'touch or feel', (instead of visual light), to detect the presence of any small portion of a quality rod. (That rod being 'at rest' or almost 'at rest'.) And so he had, say, such (certified) 'one-meter-long' rod, initially at rest, and gently touching his detector. And then he positioned that rod some distance away from his detector, and 'used a huge amount of fuel' to accelerate that initially one-meter-long rod, and cause it to pass by, (slide-by), his 'at rest', 'touch-sensing', 'point' detector. And that rod was traveling at very fast speed -- at nearly 'the speed of light'—as it passed by the detector.

Even assuming (dubiously) that the rod 'held together intact', in such 'thought-experiment' – experts seem to differ so basically about the answer to the following simple question: As to the time-span required – for the entire rod -- to have entirely passed the stationary 'touch-sensing point'! I.e., as measured by the time-clock at the point sensor, that was sensing the presence of the rod's material.

In other words, whether that time duration was virtually 'zero', i.e., because, supposedly, the fast-travelling rod had actually shrunk to virtually 'zero' length? Or whether the rod's length had not appreciably changed in length, during its fast 'fly-by'. And thus the timer-clock would have indicated a quite definite amount of time, although brief, for that one-meter-long rod to have entirely passed by the touch-sensing timer. I.e., such definite time-span -- that the outcome would be quite duplicatable with repeated tests! (As, previously mentioned, 'experts' seem to disagree as to whether the very fast-moving rod really shrunk in length, and thus what would have been that experiment's result. And I think that should be, and is, pretty embarrassing!)

4. . .And somewhat similarly, for a wheel with circular rim, spinning but without traveling, in space. And that rim's speed at nearly 'the speed of light'. Does its circular perimeter shorten (per common interpretation of famous 'MM' experimental results). But, yet, the wheel's spokes remaining unshortened – (also, per common interpretation of that 'MM' experimental result). If so, quite a 'jamming' and 'breakage' would seem to result! That 'thought-experiment' illustrates a long-known paradox -- known as the "Ehrenfest paradox"; and further details can thus be readily obtained by 'surfing the net', using the words, 'Ehrenfest paradox'.

So my point is, again, that there are some very basic ambiguities even among experts, regarding interpreting and applying some aspects of the 'General' and the 'Special' Theories of Relativity. And, I think that's a serious problem! Even though these 'thought tests' are too difficult to carry out. (And, incidentally, I think that there are important reasons why various realities do exist, and why. Although scientists find it often so convenient to suppose, instead -- that other nearly impossible conditions exist – for the efficacy of their many 'thought-experiments'!)

Conclusions and Summary

For some physics experts, our 'Abstract' is sufficient, by itself, to also serve as our 'Summary and main Conclusion'. (See beginning of article.)

We assumed the following reasonable assumption throughout this article: That suppose a very low-mass elevator was in deep, isolated, outer space, and we suddenly began accelerating that elevator? We assume that the previously discussed "launched super-fast 'gross particle' and the 'flying photon' would hit the opposite elevator wall, and at ultra-close to the same point. In-other-words, we assume Newton's first law holds good, regarding 'inertia'. And that all basic relevant laws and behaviors, as described in rather modern Physics textbooks, are correct and highly accurate.

So, I think that, in trying to broadly and simply apply 'Relativity'; the scientific mainstream over-extended themselves and failed. I.e., in this case, the flawed, "Relativity's Equivalence ('as applied to gravitation and non-gravitational accelerations')." As F. Bacon cautioned, "The subtlety of nature is greater many times over than the subtlety of the senses…" [6]

So, basically, we have studied Einstein's famous 'Equivalence Assertion' in 'General Relativity'. That is -- as it is understood and explained by Einstein himself, and most scientists). And we have shown that, regarding 'Equivalence', it does NOT always 'hold good'. I.e., contrary to what is generally believed! And we have described conditions under which that Relativity Principle FAILS. And we used the alleged Equivalency of "gravity pulling down on a stationary, earthly Elevator' compared to the 'Accelerating Rocket' deep in space " -- as an example of a 'failed equivalency'!

So, there is a basic internal difference inside a chamber between results -- depending on whether the chamber is 'being accelerated by someone pulling it, in far-out, isolated space' -- or 'gravity pulling it', instead. We even used Einstein's own prediction (maybe the greatest in history) --that Gravity bends light twice as much as Newton predicted – to illustrate why General Relativity failed. I.e., Why the failure of Einstein's own famous 'Equivalence principle' – i.e., "Gravity Equivalent to far-away spaceship acceleration"!

And some other subtle aspects of violations of the General Theory of Relativity and related subjects – were also discussed. (In fact, it has occasionally bothered me that certain aspects of 'Relativity' and earlier ideas of Ernst Mach, seem slightly to promote a return the "Ptolemaic System or the like." But further discussion of that is beyond the scope of this article.)

But the rather few violations or exceptions to 'General Relativity' discussed, although interesting and non-trivial, -- are rare. And General Relativity almost always 'holds good', and is helpful. And its likely greatest prediction, (that gravitational light bending is twice that which Newton predicted), – is a super-awesome human achievement. . I.e., as long as it continues to stand **un**violated by experiments.

References, footnotes:

[**1**]…Albert Einstein, Relativity : the Special and General Theory. (London, Methuen & Co Ltd, 1920), section XX, "The Equality of Inertial and Gravitational Mass as an Argument for the General Postulate of Relativity.", (Authorized Translation by Robert W. Lawson, D.Sc. University of Sheffield 1916), and apparently available free by online searching its title, or perhaps inserting or clicking Project Gutenberg.

[**2**]… NASA's Cosmic Times (brought to you by "Imagine the Universe!", National Aeronautics and Space Administration Goddard Space Flight Center, A service of the High Energy Astrophysics Science Archive Research Center (HEASARC), Dr. Andy Ptak (Director), Page last Updated: Fri, Dec 08, 2017. An old article, more recently made available by NASA, and that old article appearing in "Cosmic Times", 1919, in a series of articles, entitled**,** "Age of the Universe: Infinite", and entitled, "Sun's Gravity Bends Starlight *Einstein's Theory Triumphs*".

[3]…Apparently, regarding Einstein prediction of light bending (being twice that predicted by Newton) -- Sir. Joseph Thompson said this: "The greatest achievement in the history of human thought was a prediction made by Dr. Albert Einstein. Dr. Einstein's prediction was proven true during the total eclipse of the sun on May 29, 1919." ((Apparently, Sir Joseph made this pronouncement at a joint meeting of 'the Royal Society' and 'the royal Astronomical Society' in London on November 6, 1919. Dr. Einstein was then a Professor of Physics at the University of Berlin and Director of the Kaiser Wilhelm Physical Institute.))

[4]… Wikipedia -- There, we noted on 5-7-2026 -- the article available under topic, "Large Hadron Collider". (In scanning that Wikipedia article, keep in mind that a single 'at rest' Proton has an 'energy equivalent' mass of very roughly 1'Gev', and that a 1000 'Gev' equals 1'Tev'.)

[5]…Light deflection from a neutron star, AAPT – American Association of Physics Teachers, https://www.aapt.org > January 1984-Problem3 **PDF** (And similar descriptions in other good posts on the topic). ((This article indicates that if a photon passed by a neutron star very close to that star's surface, the photon would be deflected by roughly 17 Deg. And, thus I think that since a typical neutron star is less than about 15 miles in diameter -- that even a photon passing 50 miles above the neutron star's surface would obviously gravitationally deflect a very detectable distance, in our 'thought-experiment'.))

[6]… F. Bacon, , in Book I, Novum Organum (The New Organon), Aphorisms Concerning the Interpretation of Nature and the Kingdom of Man, Aphorism X, (1620). (Translated by James Spedding)

[7]… My Article revised in minor ways in June, 2026