

Example of moving goalposts: Einstein's clock mistake in his 1905 paper on relativity

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Another example of relativists (believers in Einstein's relativity) having to move the goalposts: Einstein in his 1905 paper on special relativity makes a wrong prediction about clocks, and has to be compensated for from his 1915 theory (i.e. general relativity) – in other words moving the goalposts – what he says from special relativity is wrong (in the sense of not conforming to physical reality), and goalposts have to be moved to general relativity.

Einstein wrong about clocks in his 1905 paper on SR was noted in *Physics Today* vol. 58 issue 3, 01 March 2005 [1] article "A Small Puzzle from 1905 In his first relativity paper" says: "Einstein made one erroneous prediction. Although it should have been withdrawn when he generalized the theory to include gravity, the original error has received surprisingly little attention."

Jeremy Bernstein [2] commenting on this says: "It is interesting to note that in his 1905 paper Einstein made a prediction about clock rates that is essentially wrong. He writes, "Thence we conclude that a balance clock on the equator must go more slowly, by a very small amount, than a precisely similar clock situated at one of the poles under otherwise identical conditions." If the experiment had been carried out in 1905, Einstein would have been surprised to learn that clocks go at sensibly the same rate. There is the effect of gravitation that Einstein did not know about in 1905. The equator clock is further from the gravitation center—the earth bulges—than the pole clock and

hence the gravitational effect is smaller. If the special relativity and gravitational effects are both taken into account, the rates of the two clocks are nearly identical, which is not what Einstein predicted. In fact all the identical clocks on the surface of the earth run at the same rate. One can only wonder what Einstein would have made of this result in 1905.”

Priyamvada Natarajan [2] says: “Jeremy Bernstein is right to note that Einstein himself, using his theory of special relativity, got the prediction of clock speeds wrong in 1905. He incorrectly predicted that due to the earth’s rotation, a clock at the equator would run slower than one at the poles. Einstein did not anticipate his own theory of general relativity, which he would need to get it right—this would come in 1915. In a 2005 article in Physics Today titled “A Small Puzzle from 1905,” the physicists Alex Harvey and Engelbert Schucking pointed out that Einstein made this error by failing to take into account an effect of general relativity positing that clocks more deeply embedded in a gravitational field would run slower. Clocks run slightly faster at the equator compared to the poles because the earth’s rotation produces a slight bulge at the equator. However, the earth is also rotating faster at the equator. These two effects compensate for each other exactly, causing clocks to actually run at the same rate in both locations. Harvey and Schucking give another explanation for why the rates of polar and equatorial clocks must be the same. They write that in the moving earth frame, both clocks are at rest, and since both clocks are at the same effective gravitational potential, they tick at the same rate.”

See my video on this.[3] Correcting what Einstein says in 1905 amounts to moving the goalposts. Definition [4]: “If you accuse someone of moving the goalposts, you mean that they have changed the rules in a situation or an activity, in order to gain an advantage for themselves and to make things difficult for other people.”

References

[1] Physics Today vol. 58 issue 3, 01 March 2005, p34-36

<https://physicstoday.scitation.org/doi/abs/10.1063/1.1897562?journalCode=pto>

note: Alex Harvey is a professor emeritus of physics at Queens College of the City University of New York and a visiting scholar at New York University. Engelbert Schucking is a professor of physics at New York University.

[2] <https://www.nybooks.com/articles/2014/12/04/when-einstein-was-wrong/>

[3] Video at: <https://www.youtube.com/watch?v=iaUeakBlm-M&feature=youtu.be>

[4] <https://www.collinsdictionary.com/dictionary/english/to-move-the-goalposts>

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