Dingle's "Clock Paradox" Disproof

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Abstract

In this paper we provide a concise refutation to the fringe arguments brought up by Herbert Dingle against special relativity.

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Introduction

In this appendix to "Science At the Crossroads" on page 230, Herbert Dingle writes [1]:

"Thus, between events E0 and E1, A advances by t_1' *and B by* $t_1' = at_1$ *by (1). Therefore*

$$\frac{rate\_of\_A}{rate\_of\_B} = \frac{t_1}{t_1'} = \frac{t_1}{at_1} = \frac{1}{a} > 1 \quad (3)$$

...

Thus, between events E0 and E2, B advances by t_2' *and A by* $t_2 = at_2'$ *by (2). Therefore*

$$\frac{rate\_of\_A}{rate\_of\_B} = \frac{t_2}{t_2'} = \frac{at_2'}{t_2'} = a < 1 \quad (4)$$

Equations (3) and (4) are contradictory: hence the theory requiring them must be false."

In the next section we will explain the errors in Dingle's thinking and we will provide a simple resolution.

Resolution

Assume that there is observer **A** located in frame S at location x. Observer **A** has a clock that ticks with period T. Observer **B** is located in frame S' at location x'. **B** has a clock that ticks with period T'. S' moves with speed v with respect to S. The Lorentz transform from S to S' is:

$$t' = \gamma(v)(t - \frac{vx}{c^2}) \quad (1)$$

Therefore, clock **A** is seen by observer **B** (from his location x') to have the period:

$$T_B^A = \gamma((t+T) - \frac{vx}{c^2}) - \gamma(t - \frac{vx}{c^2}) = \gamma T \quad (2)$$

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The Lorentz transformation from S' to S is:

$$t = \gamma(v)(t' + \frac{vx'}{c^2}) \tag{3}$$

Therefore, clock **B** is seen by observer **A** (from his location x) to have the period:

$$T_A^B = \gamma((t' + T') + \frac{vx'}{c^2}) - \gamma(t' + \frac{vx'}{c^2}) = \gamma T' \tag{4}$$

Observer **A** continues to measure his own clock to tick with period T. Observer **B** continues to measure his own clock to tick with period T'. Now, what happens if T=T ' (the clock periods are identical)? Then:

$$T_B^A = T_A^B = \gamma T \tag{5}$$

Conclusion

We provided a very concise disproof of Dingle's "clock paradox".

References

[1] H.Dingle, "Science At the Crossroads", 1972

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