Editorial

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Einstein's contribution: one degree of freedom in the universe

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Introduction: The one-degree of freedom $\boldsymbol{E = mC^2}$ **mass energy equivalence** proposed by **Albert Einstein** who claimed the speed of the light to be the same constant C in vacuum observed in every coordinate system. The derivation began with Henri A. Lorentz generalization of the **Galileo transform** for a **spherical light source that travels with the speed of light C from the origin**

$$x'^2 + y'^2 + z'^2 - C^2 t'^2 = x^2 + y^2 + z^2 - C^2 t^2 = 0;$$

or, in one dimension x:

$$y = y'; z = z';$$

$$x'^2 - C^2 t'^2 = x^2 - C^2 t^2 = 0$$

Since the ***Galileo transform*** $x' = x - vt;\ t' = t$ *are no longer valid. Now we wish to find a relationship with proportionality function k*

$$x' = k(x - vt)$$

$$x = k'(x' + vt')$$

$$x' = 0 \text{ leads to } k\ (x - vt) = 0$$

$$x = vt$$

$$x = k'(kx - kvt + vt')$$

which can be expressed as a function of x and t

$$t' = k\{t - x / v(1 - \frac{1}{kk'})\}$$

$$x^2 - c^2 t^2 - k^2 (x - vt)^2 + c^2 k^2 \{t - \frac{x}{v}\left(1 - \frac{1}{kk'}\right)\}^2 = 0$$

or,

$$\{1 - k^2 + k^2 \frac{c^2}{v^2}(1 - \frac{1}{kk'})^2\} x^2 + 2\{k^2 v - \frac{c^2 k}{v}\left(1 - \frac{1}{kk'}\right)\} xt + \left\{c^2 k^2 - c^2 - v^2 k^2\right\} t^2 = 0$$

This quadratic polynomial; in x & t can vanish identically only if all the coefficients vanish. We have derived the constant function

$$k = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = k'$$

In summary, we have derived H.A. Lorentz transform

$$k = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = k'$$

$$y' = y$$

$$z' = z$$

$$t' = \frac{t - \frac{v}{c^2} x}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Now we apply for the H.A. Lorentz transforms to integrate the force times the distance for the work done to become Einstein energy mass relationship.

Assume that a force $\boldsymbol{F}$ *acting a mass* $\boldsymbol{m}$ *does nothing but accelerate it, we have:*

$$\boldsymbol{F} = \frac{d(\boldsymbol{mv})}{dt} = \boldsymbol{m}\frac{dv}{dt} + v\frac{dm}{dt}$$

$$\Delta E = \int_0^f \boldsymbol{F} ds = \int_0^f \left(\boldsymbol{m}\frac{dv}{dt} + \boldsymbol{v}\frac{dm}{dt}\right) ds = \int_0^f \boldsymbol{m} v dv + \int_0^f \boldsymbol{v.vdm} = \frac{1}{2}\int_0^f \boldsymbol{m} dv^2 + \int_0^f v^2 \boldsymbol{dm}$$

From $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ *we obtain* $v^2 = c^2\left(1 - \frac{m_0^2}{m^2}\right)$*; and* $\frac{d(v^2)}{dm} = \frac{2m_o^2 C^2}{m^2}$

$$\Delta E = \int_0^f \boldsymbol{m} \frac{m_0^2 C^2}{m^3} \boldsymbol{dm} + \int_o^f C^2 \left(1 - \frac{m_o^2}{m^2}\right) \boldsymbol{dm} = \int_0^f C^2\ \boldsymbol{dm};$$

$$\Delta E = C^2 \Delta \boldsymbol{m}$$

$$E = mC^2 + ground\ state$$

This Einstein relation has been verified by ***Taurus Star light*** *passing the sun on* ***May 29 1919*** *the photon energy and its mass equivalence has been bended by the solar mass attraction predicted by Eddington, Watson, and Dyson*

$$p = mv; m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}}; E = mC^2$$

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