# A Follow-Up Demonstrable Inconsistency Between the Principle of Relativity and the Lorentz Transformations

Vesselin C. Noninski*
*New York Sofia Institute, 149 West 12th Street, New York 10011*

March 21, 2025

**Abstract**

This paper examines a contradiction in §10 [1] between the Principle of Relativity (PoR) and the combined effect of the Lorentz Transformations (LT), as well as, the flawed field transformations from §6 [2], transported into §10, erroneously equating velocity-absent to velocity-ridden quantities (LT introduce a velocity-dependent term, $\beta^3$, where PoR does not), also displaying dimensional mismatch—the left and right sides of the field transformation equations having different dimensions [2]—units misalign—electric field vs. mixed electric-magnetic terms. This instance, alongside §6's, conclusively shows that LT-derived equations contradict PoR-derived ones, LT failing to uphold PoR, challenging relativity's foundation. As a result, relativity fails to derive $E = mc^2$ via this flawed framework. The classical derivation of this relationship, based on absolute truths of physics—the definitions of velocity and acceleration—is also discussed.

## Introduction

Formulae, not words, serve as a theory's unambiguous, conclusive data—not only rivaling, but even more authoritative than experimental evidence—in defining PoR's implications for laws across inertial frames and demonstrating its function.

Relativity, as formulated by Einstein, incorporates PoR in the form of formulaic results along with the LT, which claim to describe how space and time coordinates change between moving reference frames.

Importantly, PoR is foundational to relativity, it is assumed unconditionally and therefore serves as the unquestionable criterion for the truthfulness of coordinate transformations.

Conversely, LT cannot be assumed as correct, but must be subject to verification against absolute truths of physics, such as PoR (adopted by the author of [1] also as the first postulate of relativity). In [2], however, an inconsistency was found in §6 when comparing equations obtained through PoR alone with those derived using LT. The observed inconsistency is sufficient to compromise the coherence of relativity.

Building on §6's inconsistency [2], this paper targets §10 to expose a deeper contradiction, revealing relativity's failure to derive $E = mc^2$, a relation actually inherent in classical physics—the only possible alternative to relativity. No attempt to derive

$E = mc^2$ with relativistic formulae can achieve this. This paper gives a heads up to this claim. The focal point of relativity's problems, given the goal set at the beginning, is the flawed §6 discussed in [2], §6's errors seeping into §10, which is important because §10 claims unsuccessfully to derive $E = mc^2$. Let's unravel the problems in §10—an example, symbolizing the collapse of the entire relativity and offspring.

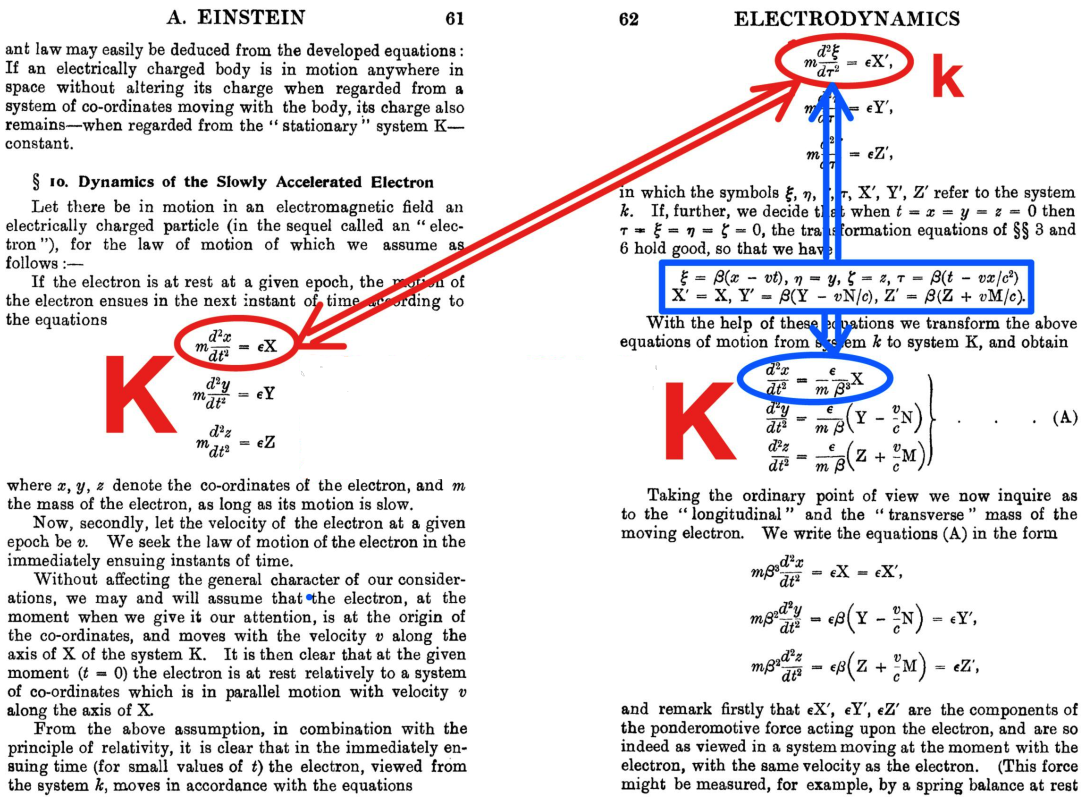
## Derivation from the Principle of Relativity

Paper [1] in §10 shows $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ in frame $K$, matching PoR's mandate—laws identical across inertial frames—without requiring LT's terms dependent on frame velocity $v$ or the second postulate's sway (cf. Fig. 1). Here, $x$ is the $K$-frame coordinate, $t$ is the time in frame $K$, $\epsilon$ is the charge of the electron, $m$ is its mass and $X$ is the component of the electric field vector along the $x$-axis of $K$. This equation, obtained without LT, is wholly velocity-independent, a direct PoR application from $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X'$ in $k$ to $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ in $K$, where $\xi$ is the $k$-frame coordinate, $\tau$ is the time in frame $k$ and $X'$ is the component of the electric field vector along the $\xi$-axis of $k$, showing what the $k$-frame law must be in $K$ frame. As relativity's first postulate, PoR sets the velocity-independent standard against which LT results must be tested. Hence, as said, LT are not assumed, but the validity of the result of their application must be tested against the absolute standard of the frame-velocity-independent $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$, which results from the application of PoR to the similarly frame-velocity-independent $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X'$. Unfortunately, LT fail the test—LT's velocity terms conflict with PoR's standard, which does not cause the appearance of velocity terms. Thus, although LT's velocity terms reflect what is expected to be relativistic effects, that is a violation of the foundational PoR, which causes the collapse of the theory. They wrongly inject frame velocity $v$ into their result, the equation $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$, which must not depend on $v$, as the standard, frame-velocity-independent equation $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ mandates—the benchmark of validity.

## Derivation Using Lorentz Transformations

The author of [1] applies LT to the same equation $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X'$ in $k$ and derives: $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ in $K$. Unlike the primed equation, this LT-derived expression depends explicitly on frame velocity $v$ via $\beta = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$, where $c$ is the speed of light, contradicting PoR's form invariance and enabling detection of uniform motion, which PoR rightfully deems undetectable; appearance of $v \neq 0$ in the formula means that the UTM can be sensed through a measurement and be compared to a measurement when $v = 0$, which will give a different result, revealing that in the first instance the frame was in motion.

Not to mention that neither is $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ in frame $K$ affected by the frame velocity $v$ of an externally moving frame $k$, nor is $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X'$ affected by the velocity $v$ of frame $K$. The motion of external things, call them objects, call them inertial frames, has no effect on what is happening in a given frame. If the opposite were true, and if the motion of external bodies affected what was going on inside a frame—objects would be of different lengths at the same time, and the hands of the clocks in that frame would be positioned in every direction at the same time.




A. EINSTEIN 61

ant law may easily be deduced from the developed equations: If an electrically charged body is in motion anywhere in space without altering its charge when regarded from a system of co-ordinates moving with the body, its charge also remains—when regarded from the "stationary" system K—constant.

§ 10. **Dynamics of the Slowly Accelerated Electron**

Let there be in motion in an electromagnetic field an electrically charged particle (in the sequel called an "electron"), for the law of motion of which we assume as follows:—

If the electron is at rest at a given epoch, the motion of the electron ensues in the next instant of time according to the equations

$$m\frac{d^2x}{dt^2} = \epsilon X$$
$$m\frac{d^2y}{dt^2} = \epsilon Y$$
$$m\frac{d^2z}{dt^2} = \epsilon Z$$

where $x$, $y$, $z$ denote the co-ordinates of the electron, and $m$ the mass of the electron, as long as its motion is slow.

Now, secondly, let the velocity of the electron at a given epoch be $v$. We seek the law of motion of the electron in the immediately ensuing instants of time.

Without affecting the general character of our considerations, we may and will assume that the electron, at the moment when we give it our attention, is at the origin of the co-ordinates, and moves with the velocity $v$ along the axis of X of the system K. It is then clear that at the given moment ($t = 0$) the electron is at rest relatively to a system of co-ordinates which is in parallel motion with velocity $v$ along the axis of X.

From the above assumption, in combination with the principle of relativity, it is clear that in the immediately ensuing time (for small values of $t$) the electron, viewed from the system $k$, moves in accordance with the equations

62 ELECTRODYNAMICS

$$m\frac{d^2\xi}{d\tau^2} = \epsilon X',$$
$$m\frac{d^2\eta}{d\tau^2} = \epsilon Y',$$
$$m\frac{d^2\zeta}{d\tau^2} = \epsilon Z',$$

in which the symbols $\xi$, $\eta$, $\zeta$, $\tau$, X′, Y′, Z′ refer to the system $k$. If, further, we decide that when $t = x = y = z = 0$ then $\tau = \xi = \eta = \zeta = 0$, the transformation equations of §§ 3 and 6 hold good, so that we have

$$\xi = \beta(x - vt),\ \eta = y,\ \zeta = z,\ \tau = \beta(t - vx/c^2)$$
$$X' = X,\ Y' = \beta(Y - vN/c),\ Z' = \beta(Z + vM/c).$$

With the help of these equations we transform the above equations of motion from system $k$ to system K, and obtain

$$\left.\begin{aligned} \frac{d^2x}{dt^2} &= \frac{\epsilon}{m}\frac{1}{\beta^3}X \\ \frac{d^2y}{dt^2} &= \frac{\epsilon}{m}\frac{1}{\beta}\left(Y - \frac{v}{c}N\right) \\ \frac{d^2z}{dt^2} &= \frac{\epsilon}{m}\frac{1}{\beta}\left(Z + \frac{v}{c}M\right) \end{aligned}\right\} \quad . \quad . \quad . \quad (A)$$

Taking the ordinary point of view we now inquire as to the "longitudinal" and the "transverse" mass of the moving electron. We write the equations (A) in the form

$$m\beta^3\frac{d^2x}{dt^2} = \epsilon X = \epsilon X',$$
$$m\beta^2\frac{d^2y}{dt^2} = \epsilon\beta\left(Y - \frac{v}{c}N\right) = \epsilon Y',$$
$$m\beta^2\frac{d^2z}{dt^2} = \epsilon\beta\left(Z + \frac{v}{c}M\right) = \epsilon Z',$$

and remark firstly that $\epsilon$X′, $\epsilon$Y′, $\epsilon$Z′ are the components of the ponderomotive force acting upon the electron, and are so indeed as viewed in a system moving at the moment with the electron, with the same velocity as the electron. (This force might be measured, for example, by a spring balance at rest

Fig. 1. From §10 [1], PoR's form invariance, sans LT.

## Analysis of the Contradiction

Since both equations describe the same law of physics—both are supposed to express exactly the same acceleration—their discrepancy is fatal. The $v$ in the second equation reveals LT imposing a dependency PoR alone neither demands nor permits, exposing a rift no postulate can bridge. The mathematical inconsistency is decisive, exposing a contradiction that topples relativity. This rift, etched in the theory's data, topples experimental crutches.

This directly contradicts the PoR requirement, explicitly exemplified in no uncertain terms by $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X' \rightleftarrows \frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ transformation, that physical laws remain identical in all inertial frames. But we don't need to only theorize, since equations—the theory's data—speak louder than words, superseding any further claims for experimental validation, especially when the data of the theory, the equations, demonstrate that these data are internally contradictory. Such a discovery invalidates any theory on the spot, making any claim for its experimental verification irrelevant, despite the widespread acceptance of the theory.

Unfortunately, this is what is observed with the theory of relativity, observed across its entire field and shown here in the present concrete form only as an example. Indeed, since $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ and $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ "must express exactly the same thing", namely, $\frac{d^2x}{dt^2}$ (cf. §6 for the same situation, in this case even more glaringly false), the following equality must hold:

$$\frac{\epsilon}{m}X = \frac{\epsilon}{m\beta^3}X, \tag{1}$$

which it does only when $v = 0$, that is, only when $\beta = 1$, i.e., only when there is no relativity. In other words, since the equality $\frac{\epsilon}{m}X = \frac{\epsilon}{m\beta^3}X$ is untrue when it comes to relativity, and since it is the PoR-obtained equality $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ that is unquestionably true because it is an expression of the foundational PoR, then the conclusion can be nothing other than that LT-obtained $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ is wrong. Introducing $v$ into an equation initially devoid of $v$ is indeed what LT are expected to do, that's part of what one understands under relativistic effect, but that conflicts with what the foundational PoR results in. Hence, the relativistic effects are necessarily out. This definitively plunges the theory of relativity into an existential problem because no reconciliation or reinterpretation of the PoR-LT incompatibility is possible. The directly demonstrable catastrophe that this result entails—the wrongness of $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$—puts an end to the speculations. This proof ends debates over PoR's understanding, application, and LT compatibility.

The above conclusive proof of the irreconcilable inconsistency of PoR vs. LT also precludes the idea that the velocity dependence introduced by LT could be interpreted as a necessary consequence of relativistic effects rather than as a contradiction. The inconsistency shown corrects the misinterpretation of PoR, erroneously perceiving it as an instrument that only ensures form invariance (covariance) of physical laws across inertial frames, but, as can often be heard, this does not preclude velocity-dependent transformations like LT. On the contrary, the shown discrepancy does preclude the wrong view that PoR need not require $v$-independence.

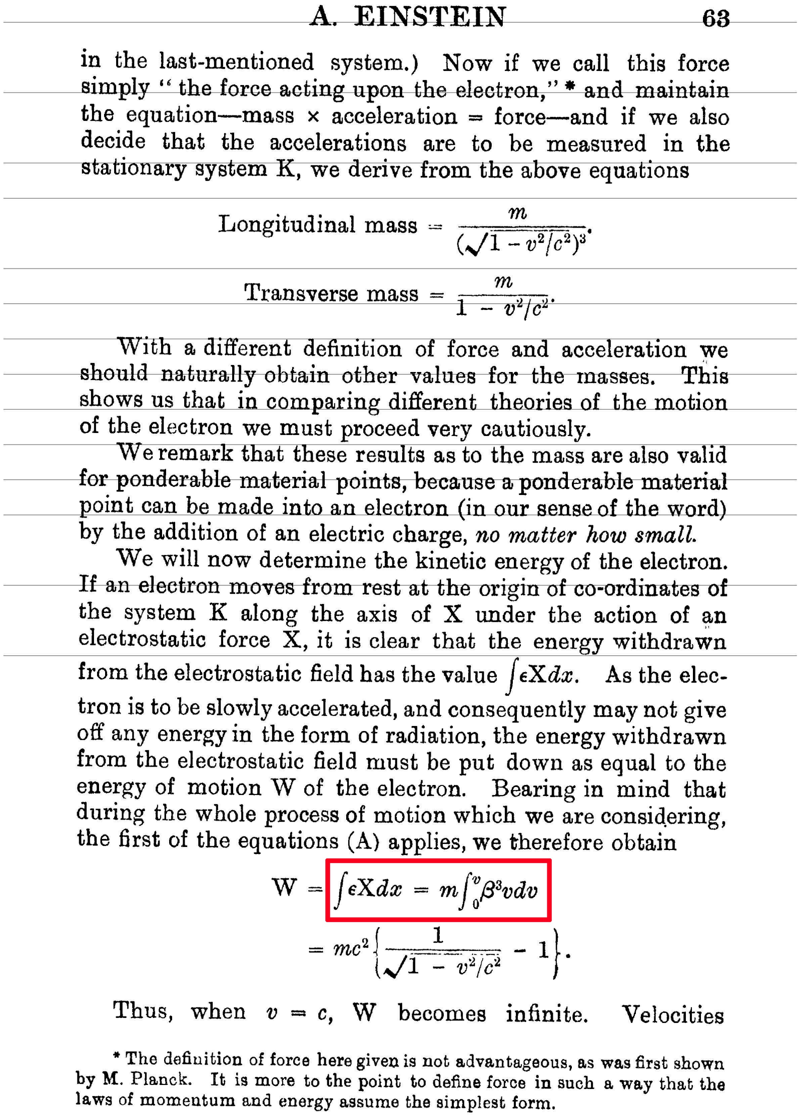
# Obfuscation Grounded

The following pivotal fact demands special attention: it is seen at once that both $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ and $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ coexist in frame $K$. This is impossible because it means that one electron in one system obeys two distinct laws simultaneously.

Here's the story: §10 seeks the electron's acceleration when at rest in an inertial frame. Take frame $k$: with assets $\xi, \tau, X'$, the law is $\frac{d^2\xi}{d\tau^2} = \frac{\epsilon}{m}X'$ —no trace of $v$, despite $k$'s motion at $v$ relative to $K$. Now, frame $K$: aligned with $k$ at $t = 0$, assets $x, t, X$, yields $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ when the electron rests there—again, velocity-independent. Einstein himself writes this in §10, PoR in full bloom, LT nowhere in sight. The task ends here: laws match across frames, as PoR demands—simple, no genius required. Yet Einstein, craving discovery, adds: "Now, secondly, let the velocity ... be $v$." This sleight-of-hand—a beguiling whisper—plants a false rift between rest and motion as if PoR falters. Enter LT, his hope for glory, overlooking that LT introduce an incompatible term, conjuring $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ in the same $K$. Two laws now vie for one acceleration: $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ and $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$. This is logically impossible—PoR's result is the truth, LT's the falsity. This impossible thing is exposed glaringly by realizing that the right sides of equalities having the same left side "must express exactly the same thing," so $\frac{\epsilon}{m}X = \frac{\epsilon}{m\beta^3}X$ —true only if $v = 0$, $\beta = 1$. No relativity survives this: LT's clash with PoR marks its end.

# Implications for $\mathbf{E = mc^2}$

The demonstrated inconsistency has significant implications for the integrity of relativity itself. By extension, the implications questioning relativity's integrity undermine any derivation and prediction based on relativistic formulae, including the alleged relativistic derivation of the mass-energy relation $E = mc^2$. This derivation crucially depends on the correctness of $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$. It is precisely this wrong equation $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$, which is integrated, that gives the illusion that relativity theory derives $E = mc^2$ (cf. Fig. 2).



**A. EINSTEIN** **63**

in the last-mentioned system.) Now if we call this force simply "the force acting upon the electron,"* and maintain the equation—mass × acceleration = force—and if we also decide that the accelerations are to be measured in the stationary system K, we derive from the above equations

$$\text{Longitudinal mass} = \frac{m}{(\sqrt{1 - v^2/c^2})^3}.$$

$$\text{Transverse mass} = \frac{m}{1 - v^2/c^2}.$$

With a different definition of force and acceleration we should naturally obtain other values for the masses. This shows us that in comparing different theories of the motion of the electron we must proceed very cautiously.

We remark that these results as to the mass are also valid for ponderable material points, because a ponderable material point can be made into an electron (in our sense of the word) by the addition of an electric charge, *no matter how small.*

We will now determine the kinetic energy of the electron. If an electron moves from rest at the origin of co-ordinates of the system K along the axis of X under the action of an electrostatic force X, it is clear that the energy withdrawn from the electrostatic field has the value $\int \epsilon X dx$. As the electron is to be slowly accelerated, and consequently may not give off any energy in the form of radiation, the energy withdrawn from the electrostatic field must be put down as equal to the energy of motion W of the electron. Bearing in mind that during the whole process of motion which we are considering, the first of the equations (A) applies, we therefore obtain

$$W = \int \epsilon X dx = m\int_0^v \beta^3 v dv$$
$$= mc^2\left\{\frac{1}{\sqrt{1 - v^2/c^2}} - 1\right\}.$$

Thus, when $v = c$, W becomes infinite. Velocities

* The definition of force here given is not advantageous, as was first shown by M. Planck. It is more to the point to define force in such a way that the laws of momentum and energy assume the simplest form.

Fig. 2. From §10 [1], LT's flawed root for $E = mc^2$.

Indeed, reversing the integral equation $\int \epsilon X\, dx = m\int_0^v \beta^3 v\, dv$ we get $\rightarrow \int \epsilon X\, dx = m\int_0^v \beta^3 \frac{dx}{dt}\, dv \rightarrow \int \epsilon X\, dx = m\int_0^x \beta^3 \frac{dv}{dt}\, dx \rightarrow \int \epsilon X\, dx = m\int_0^x \beta^3 \frac{d}{dt}\frac{dx}{dt}\, dx \rightarrow \int \epsilon X\, dx = m\int_0^x \beta^3 \frac{d^2x}{dt^2}\, dx$. Note: the integration of $\frac{d^2x}{dt^2}$ over $x$ is valid here because $\frac{d^2x}{dt^2}dx = v\, dv$, transforming the integral into $\int v\, dv$, not a direct integration over $x$. It's a standard work-energy method, not a misuse of variables.

The integral equation that is claimed to derive the celebrated $E = mc^2$ relativistically turns out to tackle the wrong LT-derived equation $\epsilon X = m\beta^3\frac{d^2x}{dt^2}$ in frame $K$.

## Engaging with Claimed Experimental Validations of Relativity

Relativity's internal contradiction—e.g., §10's $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X(PoR)$ versus $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ (LT), equal only at $v = 0$ —precludes testable outcomes, rendering experimental validation impossible. Claims of support hinge on selective readings and human oversight. Michelson-Morley's null result [9,10] requires only isotropy in the measured frame, not a constant $c$ across all. Frisch-Smith's muon study [11] compares muon sets across locations, ignoring chemical decay effects [12]. In §2 [1], Einstein's clock synchronization locks moving clocks to world time, negating time dilation. GPS corrections reflect signal propagation delays, not relativity. An absurd theory (akin to $1 = 2$) defies testing—classical physics prevails.

## Classical Derivation of $\mathbf{E = mc^2}$

With relativity's derivation of $E = mc^2$ a flop, we turn to classical physics, where—lo and behold—it's inherent. Not a choice between relativity and classical, but a necessity: $E = mc^2$, a legitimate relation, demands a true derivation. It hinges on the absolute truth of the definitions of velocity $v = \frac{dx}{dt}$ and acceleration $a = \frac{dv}{dt}$, which yield the most fundamental, absolute equation of mechanics (dynamics)—a kinematic pillar, overlooked yet absolute, for motion with constant acceleration from rest ($\int v\,dv = \int a\,dx$) $\rightarrow v^2 = 2ax$. Orthodoxy clings to $\frac{1}{2}mv^2$, but this bedrock trumps it. Multiplying by $m^2$ gives $m^2v^2 = 2m^2ax$, simplifying to $mv^2 = \underbrace{\underbrace{2ma}_{2F=F_{\text{real}}}\ x}_{\text{Energy, } E}$. Here,

$$2ma = 2F = F_{\text{real}}, \tag{2}$$

motion's true force, with $x$ as distance, so

$$E = 2max = mv^2, \tag{3}$$

doubling $\frac{1}{2}mv^2$ to correct Newton's $F = ma$, apt for rest or uniform translatory motion (UTM) where $a = 0$. Motion demands acceleration; displacement alone isn't it. Zealots crow that $a = \frac{F}{m}$ proves $F = ma$ a law of motion, but $F - F = 0$ bares a static shell. Unlike D'Alembert's $F - ma = 0$, propped by virtual forces, $v^2 = 2ax$ roots $F_{\text{real}} = 2ma$ in dynamics—motion's driver, not a tautology. Galileo's PoR, and expression of

$$UTM = rest \tag{4}$$

(probably Galileo's greatest discovery, misunderstood to this day; add to it for completeness: Newton's first law—an expression of PoR, a balance hold, and Newton's second law—an illustration of Newton's third law), PoR's root (recast by Einstein, uncredited), holds. At a classical velocity ceiling $c_m$ —akin to $c$ for photons, free of relativistic dogma—$E = mc_m^2$. More: $v^2 = 2ax$ yields $F_{\text{real}} = ma + \frac{mv^2}{2x}$, a stark correction of $F = ma$ for motion—force redefined, orthodoxy upended—$F = ma$ holds for rest or UTM. For high $v$ the concept of force blurs leaving UTM = rest alone as motion's mark, defined solely by the energy $E = mc_m^2$ of the body ($E = mc^2$ for photons).

Further details, including how classical Ampère's law expresses $E = mc^2$, are discussed elsewhere.

## Conclusion

The above is not about improving relativity—it mandates its removal. Because the crucial discrepancy is regularly missed, it must be stated again—equation $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ and equation $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ in §10 are written for the same frame $K$ exactly the way Einstein himself has written them in his own 1905 paper, translated in English (in the German original these equations are $\frac{d^2x}{dt^2} = \frac{\epsilon}{\mu}X$ and $\frac{d^2x}{dt^2} = \frac{\epsilon}{\mu\beta^3}X$, where $\mu$ denotes the mass of the electron, instead of $m$ in the English translation) and therefore "they must express exactly the same thing", but they don't. This flaw, unseen for a century despite relativity's reign, hid in plain sight—equations don't lie. This is a catastrophic discrepancy of the same character as in §6 and everywhere else in relativity, which brings down the entire relativity without a trace. The PoR-LT discrepancy described here has never been detected before, so this finding is not just a refinement of existing critiques but a matter of discovery. This PoR-LT incompatibility, now exposed, ends relativity's reign. The PoR vs. LT conflict has not been known as an issue historically, so there have not been attempts in the literature at their reconciliation, which is impossible anyway. Although there have been very thorough analyses of the foundations of relativity [3] and noteworthy critiques of relativity [4], as well as innumerable standard literature, such as [6-8], this crucial flaw, which immediately invalidates relativity and its implications and offspring in the very pages of his own 1905 paper, and which renders moot the claims for the vast body of experimental evidence supporting relativity, was hitherto unknown.

Previous critiques, such as Bergson's philosophical objections to LT's multiplicity of times [3] (Duration and Simultaneity, p. 44), Nordenson's logical challenges to frame-dependent descriptions [4] (Relativity, Time and Reality, p. 92), and Dingle's paradoxes of time dilation [5] (Science at the Crossroads, p. 112), have questioned relativity's coherence. However, none directly confront the incompatibility between LT and PoR as a mathematical contradiction within Einstein's 1905 paper (Ann. Phys., §10). This paper's demonstration—that LT's velocity-laden $\frac{d^2x}{dt^2} = \frac{\epsilon}{m\beta^3}X$ contradicts PoR's velocity-independent $\frac{d^2x}{dt^2} = \frac{\epsilon}{m}X$ in the same frame—marks a novel and final blow to relativity's foundation, unaddressed by prior scholarship.

The demonstrated inconsistency between the PoR-based equation and the LT-based equation challenges the foundational assumptions of relativity. As relativity is built upon this assumption, this failure necessitates a re-examination of the foundations of modern physics. This is not a speculative conclusion. It is final.

Future work must explore furthering classical (non-relativistic) physics, as the sole alternative for the invalid relativity, that naturally satisfies the PoR without introducing such contradictions.

## References


[1] A. Einstein, Zur Elektrodynamik bewegter Körper, *Ann. Phys.* **17**, 891 (1905). Translated in *The Principle of Relativity*, Dover, 1952, pp. 37-65.

[2] V. C. Noninski, A Demonstrable Inconsistency Between the Principle of Relativity and the Lorentz Transformations, `timeisabsolute.org/v-free_vs_v-laden_section6.pdf` (2025).

[3] H. Bergson, *Durée et Simultanéité*, Presses universitaires de France (1922). Translated in *Duration and Simultaneity*, The Bobbs-Merrill Co. Indianapolis, New York, Kansas City (1965).

[4] H. Nordenson, *Relativity, time and reality: a critical investigation of the Einstein theory of relativity from a logical point of view*, Allen and Unwin, 1969.

[5] H. Dingle, *Science at the Crossroads*, Martin Brian & O'Keeffe, London, 1972, p. 112.

[6] C. W. Misner et al, *Gravitation*, W. H. Freeman, 1973.

[7] E. F. Taylor, and J. A. Wheeler, *Spacetime Physics: Introduction to Special Relativity* 2nd ed., W. H. Freeman, 1992.

[8] E. F. Taylor, and J. A. Wheeler, *Gravity: An Introduction to Einstein's General Relativity*, Addison-Wesley, 2003.

[9] A. A. Michelson, *The Relative Motion of the Earth and the Luminiferous Ether*, Am. J. Sci. 22, 120 (1881).

[10] A. A. Michelson and E. W. Morley, *On the Relative Motion of the Earth and the Luminiferous Ether*, Am. J. Sci. 34, 333 (1887).

[11] D. H. Frisch and J. H. Smith, *Measurement of Relativistic Time Dilation Using $\mu$-Mesons*, Am. J. Phys. 31, 342 (1963).

[12] G. Friedlander et al, *Nuclear and Radiochemistry*(3rd ed.) New York: John Wiley & Sons, Inc., (1981) p. 475.

## Acknowledgments

I would like to thank Prof. Judith M. Ciottone for the insightful discussions as well as ChatGPT and Grok 3 for sharpening this stake through relativity's heart. The text was stylistically enhanced with assistance from ChatGPT and Grok 3 (xAI), but all scientific content and ideas are solely mine.