Indian Journal of Advanced Physics (IJAP)
ISSN: 2582-8983 (Online), Volume-6 Issue-1, April 2026

Falsifiability of Newton's Laws of Motion and Special Theory of Relativity – An Analytical Approach based Solution in Physics

Nishant Sahdev, Chinmoy Bhattacharya

Abstract: *Newton's laws of motion (NLM) and Einstein's Special Theory of Relativity (STR) form the conceptual backbone of classical and modern physics, respectively. Despite their extensive empirical success, both frameworks are typically formulated without explicit consideration of thermodynamic constraints such as temperature evolution, system openness, and energy dissipation. This work investigates the thermodynamic consistency of NLM and STR by analytically examining their foundational equations under closed, open, and adiabatic system conditions using established principles from classical mechanics, kinetic theory of gases, and thermodynamics. The analysis demonstrates that Newton's equations of motion implicitly assume constant acceleration and unbounded time evolution, which, when applied to open systems, violate energy conservation and imply behaviour akin to perpetual motion. By explicitly incorporating temperature as a dynamical variable and recognising its intrinsic coupling to time, modified equations of motion are derived for closed thermodynamic systems. These equations retain the functional form of Newtonian relations but introduce a bounded temperature increment, ΔT, thereby ensuring compliance with the first and second laws of thermodynamics and preventing divergence in velocity, displacement, or work. A similar thermodynamic examination of STR is conducted, focusing on relativistic length contraction, time dilation, and the mass–energy relation $E = mc^2$. When interpreted in terms of macroscopic or open systems, these relations imply the simultaneous divergence of mass and energy at high velocities, thereby contradicting conservation principles. However, when reformulated for isolated or adiabatic ideal-gas systems, analogous relativistic relationships emerge naturally from mechanical compression and temperature variation, without requiring inertial-frame abstractions or unphysical infinities. The study further demonstrates that the traditional interpretation of $E = mc^2$ as unrestricted mass–energy interconvertibility is thermodynamically inconsistent. Instead, the equation is shown to represent the mechanical work required to accelerate a mass toward relativistic speeds within a finite time, thereby highlighting the physical impossibility of reaching the speed of light for finite-energy systems. Overall, this work establishes that both NLM and STR remain conditionally valid only within restricted thermodynamic domains. By explicitly incorporating temperature, system boundaries, and energy conservation, the analysis clarifies the physical limits of these foundational theories and provides a thermodynamically consistent reinterpretation of classical and relativistic dynamics.*

Keywords: *Thermodynamic Consistency, Newton's Laws of Motion (NLM), Falsifiability, Special Relativity (STR), Thermodynamic Critique, Perpetual Motion Paradox, Closed vs Open Thermodynamic Systems.*

Nomenclature:
NLM: Newton's Laws of Motion
STR: Special Theory of Relativity

Manuscript received on 15 November 2025 | First Revised Manuscript received on 13 December 2025 | Second Revised Manuscript received on 17 March 2026 | Manuscript Accepted on 15 April 2026 | Manuscript published on 30 April 2026.
Correspondence Author(s)
Nishant Sahdev*, Department of Research & Development, Austin Paints & Chemicals Pvt. Ltd., Kolkata (West Bengal), India. Email ID: nishantsahdev.onco@gmail.com, ORCID ID: 0009-0007-2249-1006
Dr. Chinmoy Bhattacharya, Department of Research & Development, Austin Paints & Chemicals Pvt. Ltd., Kolkata (West Bengal), India. Email ID: chinmoy00123@gmail.com, ORCID ID: 0000-0002-1962-0758

I. INTRODUCTION

Newton's First Law states that 'objects at rest will remain at rest forever, and objects in motion will continue moving in a straight line indefinitely, unless acted upon by an external force.' However, it is a fact that our universe is expanding or accelerating [1]. In an expanding universe, the distances between objects continuously increase. Therefore, even if objects appear to be at rest, they are actually moving apart from each other—indicating that they are indeed in motion.

From a thermodynamic perspective, initiating the motion of an object requires work to be done on it. Since work is a form of energy, a certain amount of energy—whether large or small—must be supplied to the object. This energy is converted into force and displacement. The amount of energy required is directly proportional to the distance the object travels. Therefore, for an object to remain in motion indefinitely, it would require an infinite amount of energy, which contradicts the principle of conservation of energy. The dictum 'a moving object will stay in motion forever' effectively falls under the category of perpetual motion of the first kind. By definition, perpetual motion of the first kind refers to the generation of work without any energy input from an external source. Thus, Newton's First Law, when considered from a thermodynamic standpoint, appears to be invalid. It not only violates the law of conservation of energy but also implicitly represents a form of perpetual motion.

Newton's Second Law primarily aimed to establish a mathematical relationship between force (F), mass (m), and acceleration (f), expressed in the form of the following equation:

$$F = (m \times f) \quad \ldots \quad (1)$$

Regarding Equation (1) as proposed by Newton, the following points should be noted:

A. Newton referred to the constancy of the acceleration parameter (f); however, as shown analytically in Table 1 below using empirical data, acceleration (f) can never be considered a constant parameter.

Table I: Empirical Data of Non-Constancy of ($f = S/t^2$)

t	v = (S/t)	S	(S/t^2)
0	0	-	-
1	10	10	10
2	20	30	7.5
3	30	60	6.7
4	40	100	6.25
5	50	150	6
6	60	210	5.8
7	70	280	5.7
8	80	360	5.6
9	90	450	5.55
10	100	550	5.5

B. Newton's Second Law of Motion violates the principle of conservation of energy and falls under the category of 'perpetual motion of the second kind.' This type of perpetual motion refers to the complete conversion of energy or heat into work, which directly contradicts the Second Law of Thermodynamics. This contradiction is further explained below:

For a specified mass 'm', if acceleration 'f' is also assumed to be constant—as Newton proposed—then the force would remain constant over time according to Equation (1), since 'm' is also continuous. Now

$$\text{Energy} = \text{Work} = (\text{force x distance}) = (\text{F x S}) \quad \dots \quad (2)$$

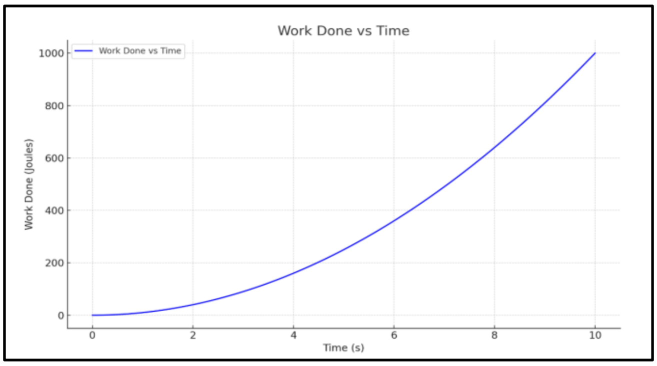
By combining Equation (1) and Equation (2), the following result is obtained:

$$\text{Energy} = \text{Work} = (\text{m x f x S}) \quad \dots \quad (3)$$

For an accelerating object, the distance S continuously increases with time t. Hence, according to Equation (3) above, not only is energy fully converted into work, but the work also approaches infinity as a function of time t, as proposed by Newton.

$$\text{Distance} = S = [ut + ½ (ft^2)] \quad \dots \quad (4)$$

The curve of 'work done' versus time t is shown in Figure 1 below [****Data Table:** Included in Appendix*].



[Fig.1: Work Done vs Time Curve]

Thus, Newton's Second Law of Motion violates the law of conservation of energy and falls into the category of perpetual motion of the second kind. For the same reason, the following equations of motion proposed by Newton are also not acceptable.

- $v = u + ft$
- $S = [ut + ½ (ft^2)]$
- $v^2 = u^2 + 2fS$ [u and v are the initial and the final velocities, respectively].

i. Newton's Third Law of Motion, however, falls into the category of 'perpetual motion of the third kind' because it neglects factors such as frictional loss and energy dissipation. The statement of the Third Law—'to every action there is an equal and opposite reaction'—does not account for these energy losses. Therefore, Newton's Third Law must also be reconsidered or ruled out on this basis.

ii. The Special Theory of Relativity (STR) principally deals with the following phenomena:

a. Different inertial frames with velocities (v) of objects ranging from zero up to the speed of light (C).

b. The phenomena of relativistic length contraction, relativistic time dilation, and relativistic mass escalation, expressed through the following mathematical equations:

$$L = \left[L0 \sqrt{1 - \frac{v^2}{c^2}} \right] \quad \dots \quad (5)$$

$$t = \left[t0 \sqrt{1 - \frac{v^2}{c^2}} \right] \quad \dots \quad (6)$$

$$m = \left[\frac{m0}{\sqrt{1 - \frac{v^2}{c^2}}} \right] \quad \dots \quad (7)$$

Here, L_0, t_0, and m_0 represent the original (rest) length, time, and mass, respectively, while L, t, and m denote the corresponding relativistic (observed) length, time, and mass.

From Equations (5), (6), and (7), it follows that as v approaches C, L and t approach zero, while m approaches infinity.

c. The energy (E)–mass (m) equivalence in the universe is expressed as:

$$E = mC^2 \quad \dots \quad (8)$$

The dimensional equation of energy in terms of mass (m), length (L), and time (t) is:

$$E = m\, L^2 t^{-2} \quad \dots \quad (9)$$

Now the mathematical expression of the relativistic energy (E_{rel}) using equations (5), (6) and (7) would be,

$$\text{Erel} = \left[\frac{m_0}{\sqrt{\left(1-\frac{v^2}{c^2}\right)\left[L_0\left(1-\frac{v^2}{c^2}\right)\right]\left[\frac{1}{t_0\left(1-\frac{v^2}{c^2}\right)}\right]}} \right]$$

Or

$$\text{Erel} = \left[\frac{m_0 L_0}{t_0\sqrt{1-\frac{v^2}{c^2}}} \right] \quad \ldots \quad (10)$$

From Equation (10), it follows that as v approaches C, the relativistic energy E_{rel} also approaches infinity. However, the law of conservation of energy–mass in the universe states that the total energy and mass remain constant. This implies that as mass increases, energy must decrease, and vice versa, to maintain the conservation of both quantities. The Special Theory of Relativity (STR), however, leads to the contradictory conclusion that both mass and energy simultaneously approach infinity at relativistic speeds (as seen in Equations (7) and (10) above). Therefore, STR violates the law of conservation of energy, casting doubt on its practical validity.

II. OBJECTIVE

A general rule in physics is that as an object's velocity increases, its temperature rises. This stems from the relationship between translational kinetic energy and temperature, expressed as:

Kinetic Energy = 3/2 kT

where k is the Boltzmann constant, and T is the absolute temperature. As molecular velocity increases, so does kinetic energy, leading directly to a rise in temperature. However, in Newton's extensive development of classical mechanics and the laws of motion, the thermodynamic parameter of *temperature* was never incorporated. Likewise, in Einstein's Special Theory of Relativity (STR), despite a detailed treatment of relativistic time, length, and velocity, the behaviour of temperature at relativistic scales was not considered. Had temperature been accounted for, the self-consistency of STR would have faced significant thermodynamic challenges.

All macroscopic baryonic matter is ultimately composed of microscopic atoms and molecules. It is the velocity of these constituent molecules that fundamentally determines the thermodynamic state of matter. If one attempts to derive a relation between mass and energy, it is essential to consider molecular velocities, at which point temperature naturally enters the equation.

To illustrate, if the average molecular velocity of hydrogen gas is taken to be equal to the speed of light C, then, using the kinetic theory of gases: $\mathbf{v} = \sqrt{[8RT/\boldsymbol{\pi}M}$

(where R is the universal gas constant, T is temperature, and M is molar mass), the resulting temperature exceeds 1.3×10^{13} K. Even if the molecular velocity is assumed to be just 0.001% of the speed of light, the corresponding temperature reaches approximately 1300 K—already above hydrogen's autoignition temperature of ~800 K. This suggests that STR is not only problematic at relativistic speeds but also fails to remain consistent in the non-relativistic regime when real molecular behaviour and thermal constraints are considered. Since macroscopic motion is a cumulative manifestation of microscopic behaviour, any object moving at velocity v implies that its molecules must also move at that speed. Yet molecular velocities are intrinsically linked to temperature. As this article demonstrates, time and temperature are closely coupled. Therefore, any physical model connecting energy to velocity, or force to velocity or acceleration, must account for both time and temperature.

Moreover, not all combinations of time t and velocity v are thermodynamically valid. A theoretically computed time may yield an associated temperature that violates the second law of thermodynamics, resulting in unphysical outcomes. For instance, an object calculated to reach velocity v after time t might require a corresponding increase in temperature that violates the system's thermodynamic constraints. Thus, both Newton's equations of motion and Einstein's relativistic framework—including the iconic equation $E = mc^2$, the concepts of time dilation, length contraction, and the twin paradox—fail to uphold the law of conservation of energy when thermal behaviour is adequately considered. These models inadvertently imply conditions akin to a perpetual motion machine—something prohibited by fundamental thermodynamic laws. This article introduces a new framework in which time and temperature are interlinked, such that increases in velocity or time are inherently bounded by a limiting parameter ΔT\TΔT: the maximum possible temperature rise from ambient conditions. This constraint ensures compliance with the principles of mass and energy conservation and preserves the integrity of thermodynamic laws.

III. METHODOLOGY

A. Falsifiability of the STR Mathematical Equation, $E = mC^2$, with Respect to Mass–Energy Equivalence

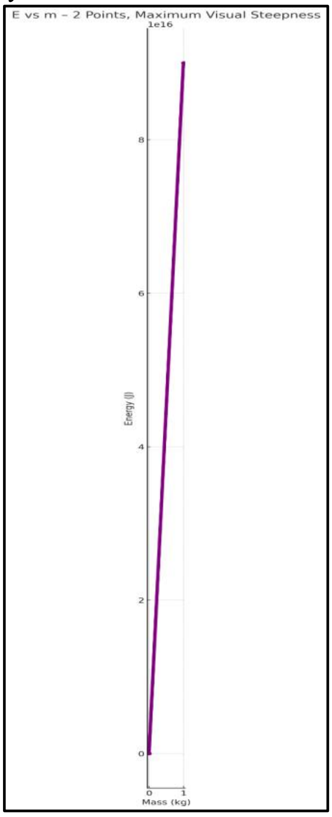
The famous mathematical equation of the Special Theory of Relativity, $E = mC^2$, has long been regarded as the definitive expression of mass–energy equivalence. The traditional interpretation of this equation suggests that when mass is converted into energy—even a small amount—an enormous quantity of energy is released. For example, according to this equation, converting just 1 gram of any baryonic matter in the universe would yield the following amount of energy (with the speed of light, (velocity of light $C = 3 \times 10^{10}$ cm/sec).

$$\begin{aligned} E = mc^2 &= 1 \times (3 \times 10^{10})2 = (9 \times 10^{20})\text{ergs} \\ &= (9 \times 10^{13})\text{cal} \\ &= (9 \times 10^{10})\text{kcal} \quad \ldots \quad (11) \end{aligned}$$

The energy calculated above is theoretically sufficient to heat approximately 1,000 tons of water from ambient temperature to its boiling point at 100°C. At first glance, this seems implausible—and if it were indeed so straightforward, there would be no global energy crisis. Scientists would not be urgently searching for alternative energy sources. such as wind, hydro, solar, or thermal power.

What is even more striking is that the global scientific community has remained largely silent for decades regarding the graphical interpretation—specifically, the slope—of the E versus m plot derived from Equation (11). This plot is a straight line passing through the origin, with slope C^2, the square of the speed of light. The magnitude of this slope is enormous: 9×10^{20} ergs/gram in CGS units or 9×10^{16} joules/kilogram in SI units.

Due to this extremely high slope, the E versus m graph (as shown in Figure 2 below) [****Data Table****: *Included in Appendix*] appears nearly parallel to the energy axis (Y-axis). As a result, energy approaches infinity with increasing mass—an outcome that contradicts the law of conservation of energy and is therefore not an acceptable conclusion in fundamental physics.



[Fig.2: Energy vs Mass Graph]

In nuclear power reactors, the generation of a large amount of energy is attributed to the concept of 'mass defect' (Δm), and the energy released (ΔE) is claimed to follow Einstein's mass–energy equivalence relation, given as:

$$\Delta E = \Delta mc^2 \quad \ldots \quad (12)$$

However, this interpretation is fundamentally flawed. The phenomenon of 'mass defect' arises specifically from nuclear reactions such as fission or fusion involving atomic nuclei. Einstein's Special Theory of Relativity (STR), on the other hand, is not directly concerned with the nucleus of atoms. Instead, it addresses inertial frames, rest mass, relativistic mass, length contraction, time dilation, the Lorentz factor, and the change in an object's energy with velocity. Therefore, applying the mass–energy equivalence equation to nuclear reactions is logically and scientifically unjustified within the framework and philosophy of STR.

The mass defect and the substantial energy released in nuclear reactions—whether fission or fusion—are more accurately associated with nuclear topology, thermodynamic transformations, and quantum entanglement within the structure of space quanta, as recently reported in the literature.

The physical significance of $E = mC^2$ is fundamentally different from the traditional interpretation of the 'interconvertibility' of mass and energy. In reality, the E in Einstein's equation represents not just generic energy, but more specifically the 'work done' on a mass. When properly understood, this equation can be derived in just two or three logical steps. More precisely, E corresponds to the mechanical work done—expressed as:

Energy = (Force x distance) = (mass x acceleration x distance)]

—to accelerate a rest mass m up to the speed of light, cover a time span of 1 second, as shown below.

Acceleration of the rest mass = (final velocity - initial velocity)/time = [(C - 0)/1] = C … (13)

Now, work done, E = Energy = (Force x distance) = (mass x acceleration x distance)]

Or,

E = m x C x C [since in 1 sec the mass travels a distance C only] = mC^2 … (14)

For the microscopic particles, as for a single molecule of hydrogen (approximate mass 3.3×10^{-27} kg), the work done (E) would be,

$$E = [(3.3 \times 10^{-27}) \times (3 \times 10^{8})^2$$
$$= 3 \times 10^{-10} \text{ joules} \quad \ldots \quad (15)$$

While the work done, as shown in the equation, is vanishingly small in magnitude for a single particle or unit mass, it becomes significant when applied to a large assembly of molecules. For example, in the case of a 10 kg steel ball, the total work done would be:

$$E = (10 \times 9 \times 10^{16}) = 9 \times 10^{17} \text{ joules} \quad \ldots \quad (16)$$

While the work done to propel a rocket of mass approximately 1000 kg from Earth is on the order of 10^{10} joules [3], the work calculated in equation (16) for a 10 kg mass is approximately 107 times the value. For even larger masses, the energy required to accelerate them to the speed of light would necessitate a violation of the law of conservation of energy [55]. Consequently, it is concluded that no celestial object can be accelerated to the speed of light. Proper calculations indicate that even reaching about 15-20% of the speed of light would require violating the conservation of energy [4].

The conclusions regarding the equation $E = mC^2$ proposed by Sir Albert Einstein are as follows:

i. The utility of this equation lies primarily in illustrating the thermodynamic impossibility—or 'forbiddingness'—of accelerating an object to the speed of light.

ii. This equation should not be treated as a mass–energy equivalence equation in the context of physics.

iii. This equation predicts the amount of work

Retrieval Number:100.1/ijap.A107406010426
DOI:10.54105/ijap.A1074.06010426
Journal Website: www.ijap.latticescipub.com

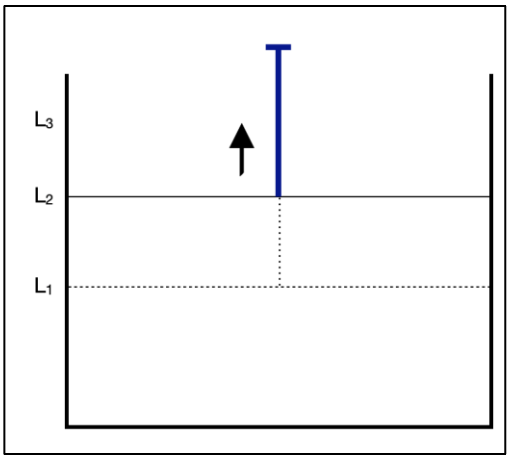
Published By:
Lattice Science Publication (LSP)

required to accelerate a mass m instantaneously (within 1 second) from a state of rest to the speed of light, C.

iv. The Special Theory of Relativity (STR) is fundamentally inadequate for calculating the energy involved in nuclear reactions; a new quantum-based model in physics is required to describe such phenomena [**Error! Reference source not found.**] accurately.

B. Thermodynamic Closed System and Newton's Equation of Motion

As established in the introduction of this article, Newton's equations of motion are thermodynamically forbidden for open systems. However, for closed systems—as illustrated in Figure 3 below—consider an ideal gas enclosed in a cylinder with a movable piston, initially in equilibrium with atmospheric pressure PPP at a temperature of T Kelvin. The system temperature is gradually increased from T to T+1, T+2, T+3, and so on by supplying heat from an external source. As a result, the piston rises from its initial height L1 to successive positions L2, L3, L4, etc., as the gas expands under constant external pressure P. The increase in piston height corresponds directly with the rise in temperature over time.



[Fig.3: Impression of an Ideal Gas Under Constant Pressure Upon Heating in a Closed Thermodynamic System]

According to the kinetic theory of ideal gases, the average velocity (U_{av}) of the molecules of a perfect gas at a temperature T Kelvin is given by:

$$\mathrm{Uav} = \sqrt{\frac{8RT}{\pi M}} \quad \ldots \quad (17)$$

[R is the universal gas constant and M is the molecular weight of the gas].

In both Newtonian physics and the kinetic theory of gases, one significant aspect that has long been overlooked is the interrelationship between *temperature* and *time*. The expressions for energy in the kinetic theory of gases and in quantum physics are as follows:

$$\text{Kinetic Theory} \qquad \text{Energy} = \frac{3}{2}(\mathrm{NkT}) \quad \ldots \quad (18)$$

$$\text{Quantum Physics} \qquad \text{Energy} = h\nu \quad \ldots \quad (19)$$

Here, N, k, h, and ν represent Avogadro's number, Boltzmann constant, Planck's constant, and the frequency of the wave, respectively. The unit of h is energy·second. Since R = N·k, both R and k have the unit of energy per kelvin (energy/K). The unit of ν is inverse time (time^{-1}).

Equations (18) and (19) can be expressed in the following manner, too.

$$\text{Energy} = \frac{3}{2}\left(\frac{\text{energy}}{\text{temperature}}\right) \text{x (temperature)} \quad \ldots \quad (18a)$$

$$\text{Energy} = (\text{energy x time})\text{x}\left(\frac{1}{\text{time}}\right) \quad \ldots \quad (19a)$$

By comparing equations (18a) and (19a), an interrelationship between temperature T and time t can be established as follows:

$$\mathrm{T} = \left(\frac{1}{t}\right) \text{ or } t = \left(\frac{1}{T}\right)$$

Or

$$\mathrm{Tt} = 1 \quad \ldots \quad (20)$$

Hence, time t and temperature T are multiplicative inverses of each other, since their product equals unity. This T-t relationship has remained hidden in the scientific literature, but through the analytical approach presented here, it is now revealed.

From equation (17), it is found that the average velocity of the molecules of an ideal gas is directly proportional to the square root of the temperature. The rate of increase of velocity as a function of time can be evaluated by differentiating both sides of equation (17) with respect to T, as follows:

$$(\mathrm{dUav/dT}) = \tfrac{1}{2}[\sqrt{\left(\frac{8R}{\pi M}\right)}\, T^{-\frac{1}{2}}$$

Or

$$(\mathrm{dUav/dT}) = \tfrac{1}{2}[\sqrt{\frac{8RT}{\pi M}}\left(T^{-\frac{1}{2}} \mathrm{x}\, T^{-\frac{1}{2}}\right)$$

Or

$$(\mathrm{dUav/dT}) = \tfrac{1}{2}[\sqrt{}(8R/\pi M)\, T^{-1}$$

Or

$$(\mathrm{dUav/dT}) = [\,\tfrac{1}{2}\frac{\left[\sqrt{\frac{8R}{\pi M}}\right]}{T}$$

$$\left(\frac{\mathrm{dUav}}{\mathrm{dT}}\right) = \frac{1}{\frac{2[\mathrm{Uav}]}{T}} \quad \ldots \quad (21)$$

So, when the temperature increases by 1 Kelvin, the U_{av} = U_1 (say) increases to U_2, and the relation between U_1 and U_2 becomes,

$$U_2 = U_1 + \frac{1}{\frac{2[U_1]}{(T)}} \quad \ldots \quad (22)$$

Considering the time–temperature relationship between T and t [equation (20) above], it can be expressed as follows:

$$U_2 = U_1 + 1.\frac{1}{2[U_1]t} \quad \ldots \quad (23)$$

Now, if the temperature increases by 2 kelvin and

Retrieval Number:100.1/ijap.A107406010426
DOI:10.54105/ijap.A1074.06010426
Journal Website: www.ijap.latticescipub.com

Published By:
Lattice Science Publication (LSP)

reaches (T+2) kelvin, the velocity U_3 will be,

$$U_3 = U_1 + 2.\frac{1}{2[U_1]t} \quad ... \quad (24)$$

So, the general expression of the final velocity (U_f) and the initial velocity (U_i) would be,

$$U_f = U_i + (\Delta T - 1)kt \qquad \left(k = \frac{Ui}{2}\right)$$

For large ΔT, 1 can be neglected from the above equation, and it can be written as,

$$Uf = Ui + \Delta Tkt \quad ... \quad (25)$$

Now, if U_f and U_i are replaced by V and U, respectively (final and initial velocities), it can be written as follows:

$$V = U + \Delta Tkt \quad ... \quad (26)$$

Equation (26) is in a form almost similar to Newton's equation of motion.

$$V = U + ft \quad ... \quad (27)$$

While Newton's equation assumes the acceleration parameter f to be constant, in the newly derived equation (26), the term ΔTk is not continuous, since both ΔT and U_i can vary. As demonstrated earlier in this article, f cannot maintain a constant value. A key point to note is that Newton's equation (27) for open systems violates the law of conservation of energy because it depends solely on f and time t, completely excluding the temperature parameter. Since temperature is a direct indicator of energy, omitting it violates energy conservation. In contrast, equation (26) incorporates both time and temperature, making it more physically consistent. For a closed system, ΔT cannot be arbitrarily increased, as the system eventually reaches thermal equilibrium, beyond which its temperature no longer rises. Any further increase in temperature would compromise the closed system's integrity, rendering it an open system. However, Newton's laws do not apply to open systems precisely because they violate the conservation of energy.

The distance S_i travelled by the molecules of the gas at temperature T can be expressed as the product of their average velocity and time, i.e.,

$$S_i = U_i\, t \quad ... \quad (28)$$

Now, as the temperature increases by ΔT, the average velocity of the gas molecules increases accordingly,

$$S_f = \left(\frac{U_i + \Delta T \left(\frac{1}{2}\right) U_i}{T}\right) t \quad ... \quad (29)$$

Since, as per the derived equation (21), each unit increase in temperature leads to an increase in average velocity by [(1/2) U_i/T], equation (29) can now be rearranged as:

$$S_f = U_{it} + \frac{\left(\frac{1}{2}\right)\Delta T U_{it}}{T} \quad ... \quad (30)$$

Now using the relationship Tt =1 in equation (20), equation (30) can be rewritten as,

$$S_f = U_{it} + \left(\frac{1}{2}\right)\Delta T U_{it} 2 \quad ... \quad (31)$$

In a more general form, equation (31) can be written as,

$$S = U_t + \Delta T k t^2 \qquad \left[\text{as shown } k = \left(\frac{U}{2}\right)\right] \quad ... \quad (32)$$

If the distance–time equation of motion derived by Newton is,

$$S = U_t + \left(\frac{1}{2}\right) f t^2 \quad ... \quad (33)$$

For the same reasoning as cited above, equations (26) and (27), Newton's equation (33) is falsified in physics.
Now, from equation (26), it is found that,

$$t = \frac{(V - U)}{\Delta Tk} \quad ... \quad (34)$$

Now the distance travelled by the molecules (S) would be the average velocity [(U +V)/2] multiplied by the time, t, as,

$$S = \left[\frac{U + V}{2}\right] x\, t \quad ... \quad (35)$$

Putting the value of t from equation (34) in equation (35), one gets,

$$S = \left[\frac{U + V}{2}\right] x \left[\frac{V - U}{\Delta Tk}\right]$$

Or,

$$S = \frac{(V2 - U2)}{2\Delta Tk}$$

Or,

$$(V_2 - U_2) = 2\,\Delta TkS$$

Or,

$$V_2 = U_2 + 2\,\Delta TkS \quad ... \quad (36)$$

The Newton-derived relation is,

$$V_2 = U_2 + 2fS \quad ... \quad (37)$$

It is again important to highlight that equation (36), as derived in this article, is a thermodynamically valid equation for a closed system. In contrast, Newton's equation (37) is falsified, as it violates the conservation of energy and incorrectly assumes that the parameter *f* is constant.

Newton's equation V = U + ft. Equation as derived V = U + ΔTkt

Newton Equation S = Ut + (1/2) ft^2
Equation as derived S = Ut + ΔTkt^2

Newton Equation $V^2 = U^2 + 2fS$
Equation as derived $V^2 = U^2 + 2\,\Delta TkS$

The three equations of motion derived by Newton are shown side by side with those derived in this article. The presence of the ΔT parameter (representing the increase in temperature of the closed system) in the equations derived here is the key factor ensuring that they do not violate the law of conservation of energy. This is because ΔT cannot be increased arbitrarily; in a closed system, there is a natural limit to ΔT. Once thermal equilibrium with the surroundings is attained, the temperature reaches a maximum beyond which it cannot increase further.

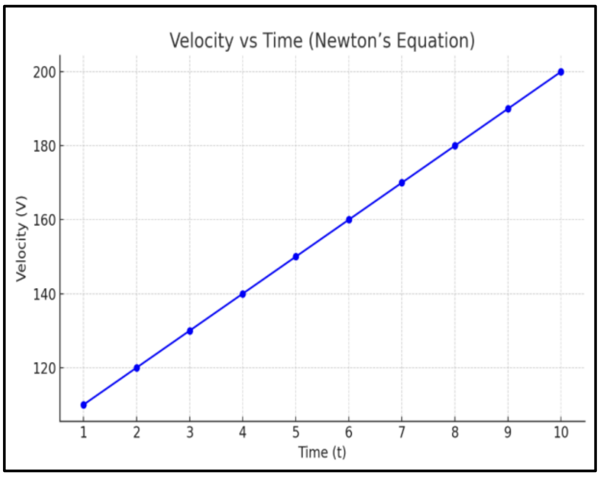
Any attempt to raise the temperature beyond this point would cause the closed system to break down.

Therefore, according to the equations of motion derived in this work, neither the velocity (V) nor the displacement (S) can grow indefinitely. In contrast, Newton's equations yield values of V and S that increase without bound, tending toward infinity. In effect, Newton's equations imply perpetual motion—an idealised phenomenon that is not physically realisable in our universe.

The plots of V versus t, S versus t, and V versus S for Newton's equations, compared to the corresponding plots from the current model—equations (26), (32), and (36)—are presented in Figures 3a through 3f. These are based on empirical data from Tables 1a (Newton model), 1b (current model), 1c (Newton model), 1d (current model), 1e (Newton model), and 1f (current model), respectively.

Table II: Empirical Data of V Versus t as Per Newton's Equation V = U + ft [U = 100, f =10, t = 1,2,3,4, 5, 6, 7, 8, 9, 10)

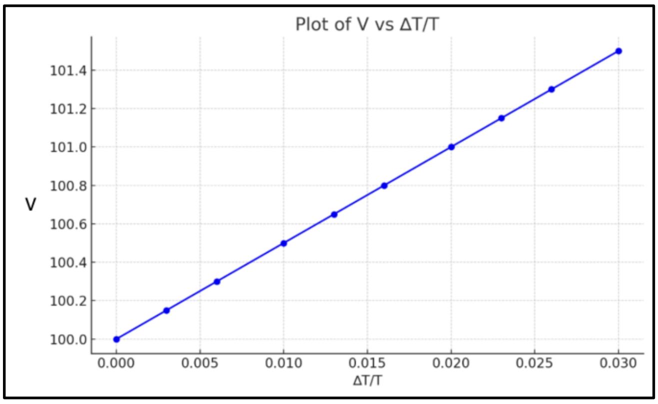
t (s)	V (m/s)
1	110
2	120
3	130
4	140
5	150
6	160
7	170
8	180
9	190
10	200



[Fig.3a: Typical Plot of V Versus t Based on Table 1a (Newton Model)]

Table III: Empirical Data of V Versus t as Per Equation V = U + ΔTkt [Equation (26] with (ΔTt) = (ΔT/T) = 0, 0.003, 0.006, 010, 013, 0.016, 0.020, 0.023, 0.026, 0.030, k= U/2 =50]

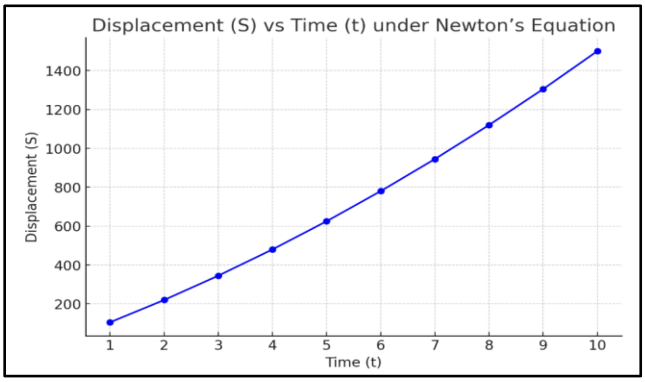
V	(ΔTt) = (ΔT/T)
100.15	0.003
100.30	0.006
100.50	0.010
100.65	0.013
100.80	0.016
101.00	0.020
101.15	0.023
101.30	0.026
101.45	0.030



[Fig.3b: Typical Plot of V Versus t Based on Table 1b (Current Model)]

Table IV: Empirical Data of S Versus t as Per Newton's Equation S = Ut + (1/2) ft2 [U = 100, f = 10, t = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

t (s)	S
1	105
2	220
3	345
4	480
5	625
6	780
7	945
8	1120
9	1305
10	1500

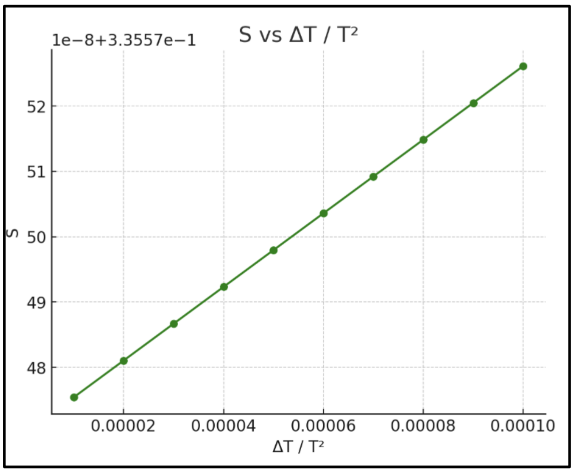


[Fig.3c: Typical Plot of S Versus t Based on Table 1c (Newton Model)]

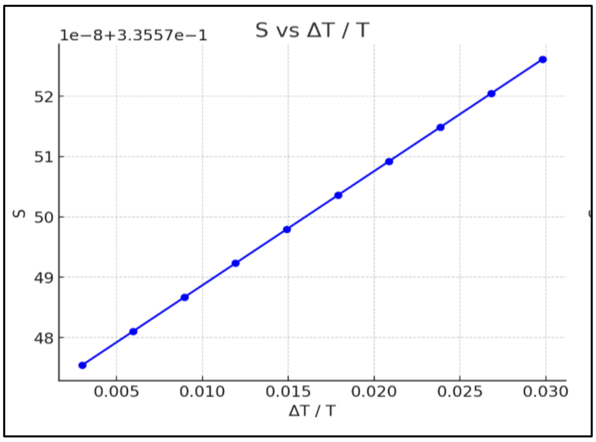
Table V: Empirical Data of S Versus t as Per Equation S = Ut + ΔTkt2 [Equation (32] with (ΔTt2) = (ΔT/T2) = 0.00001, 0.00002, 0.00003, 0.00004, 0.00005, 0.00006, 0.00007, 0.00008, 0.00009, 0.0001, k= U/2 = 50, t = (1/T) = (1/298) = 0.003]

S	ΔT/T	(ΔTt^2) = ($\Delta T/T^2$)
0.3005	0.000	0.00001
0.3010	0.003	0.00002
0.3015	0.006	0.00003
0.3020	0.010	0.00004
0.3025	0.013	0.00005
0.3030	0.016	0.00006
0.3035	0.020	0.00007
0.3040	0.023	0.00008
0.3045	0.026	0.00009

0.3050	0.030	0.0001



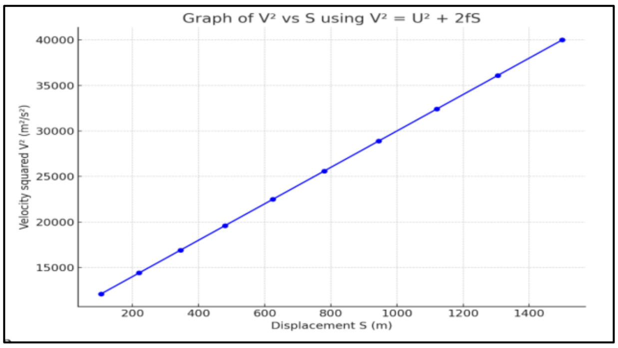
[Fig.3d: S Versus (ΔT/T2) Plot Based on Data Table 1d (S vs ΔT/T2)]



[Fig.3e: Plot of S Versus (ΔT/T) Based on Data Table 1d (S vs ΔT/T)]

Table VI: Empirical Data of V Versus S as Per Newton's Equation V2 = U2 + 2fS [U = 100, f = 10, t = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

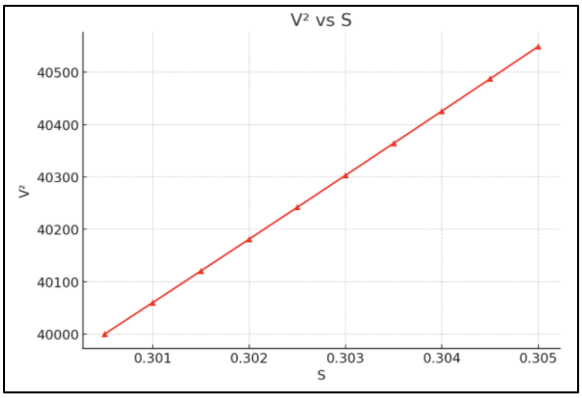
V	S
110	105
120	220
130	345
140	480
150	625
160	780
170	945
180	1120
190	1305
200	1500



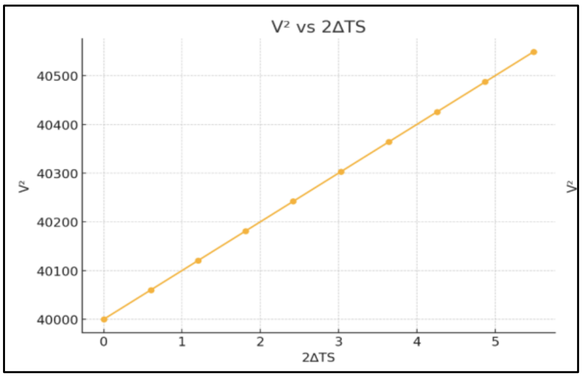
[Fig.3f: Plot of V2 Versus S based on Table 1e (V2 vs S), Newton's Model]

Table VII: Empirical Data of V Versus S as Per equation V2 = U2 + 2ΔTkS [Equation (36] with ΔT = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, k = U/2 = 100, S = 0.3005, 0.3010, 0.3015, 0.3020, 0.3025, 0.3030, 0.3035, 0.3040, 0.3045, 0.3050]

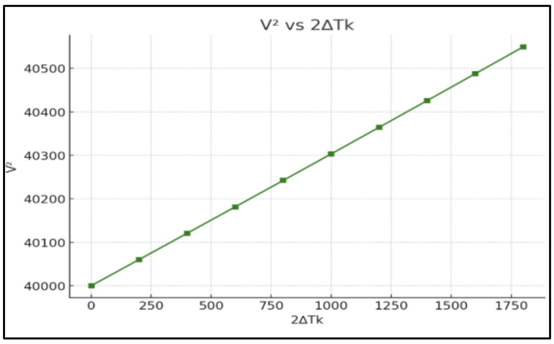
V^2	2ΔTS	2ΔTk	S
10000	0.000	0	0.3005
10030.1	0.603	100	0.3010
10060.3	1.206	200	0.3015
10090.6	1.812	300	0.3020
10121	2.420	400	0.3025
10151.5	3.030	500	0.3030
10182.1	3.642	600	0.3035
10212.8	4.256	700	0.3040
10243.6	4.872	800	0.3045
10274.5	5.490	900	0.3050



[Fig.3g: Plot V2 Versus S Based on Table 1f (V2 vs S), Current Model]



[Fig.3h: Plot of V2 Versus 2ΔTS) Based on Table 1f (V2 vs 2ΔTS) Current Model]



[Fig.3i: Plot of V2 vs 2ΔTk) Based on Data of Table 1f (V2 vs 2ΔTk) – Current Model]

The following equivalences among the parameters of Newton's model vis-à-vis the current model are to be noted regarding the following Figures 3a, 3b, 3c,3d, 3e and 3f

f (Newton) = k (current model)

In equation V= U + ft, of Newton, the 't' is equivalent to 'ΔTt' of the equation V = U + ΔTkt of the current model.

In equation S= Ut + $1/2ft^2$, of Newton, the 't^2' is equivalent to '$\Delta Tt^2 = \Delta T/T^2$' of the equation S = Ut+ ΔTkt^2 of the current model.

In equation $V^2 = U^2 + 2fS$, of Newton, the '2S' is equivalent to '2ΔTS' of the equation,

$V^2 = U^2 + 2\ \Delta TkS$ of the current model.

From the graphical plots shown in Figures 3a to 3i, it is observed that the general patterns of the plots for V versus t, S versus t, and V^2 versus S (for both Newton's model and the model proposed in this article) appear similar in shape. However, while the current model is thermodynamically justified, Newton's model is fundamentally flawed. This is because, in Newton's equations, the parameters V and S can grow without bound and attain arbitrarily large values. In contrast, in the current model, the values of V and S are inherently limited by the parameter ΔT, which represents the temperature difference between the final and initial states of the closed system. For a closed thermodynamic system, ΔT cannot exceed a certain maximum threshold defined by the system's equilibrium with its surroundings. Once this thermal equilibrium is achieved, further temperature increases are not possible without disrupting the system's integrity. Therefore, the current model respects the physical constraints imposed by thermodynamics, whereas Newton's model violates them by implying infinite growth of physical quantities, which is not physically realistic.

1. Thermodynamic validity of Newton's expression of force

Newton's expression of force regarding mass and acceleration is,

$$\text{Force} = (\text{Mass x Acceleration}) \quad \ldots \quad (38)$$

However, Newton did not provide a topological or schematic representation to explain the application of force. The following key elements were notably absent from his formulation of the second law of motion:

i) The shape of the object
ii) The device by which the force is applied to the object
iii) The duration of the force on the object
iv) The time of persistence of acceleration on the object

The above points are critically important from a thermodynamic perspective. From equation (37), a physics student at the school level might mistakenly infer that applying a force to an object would result in perpetual acceleration, allowing the object to travel endlessly—even beyond the bounds of the universe—as a function of time. This misinterpretation arises from the lack of thermodynamic constraints in Newton's formulation. Furthermore, the contact surface area between the object and the force-application device is substantial. A larger contact area results in a greater force being exerted. This surface area is also inherently linked to the object's volume, establishing a connection between force transmission and the system's physical geometry.

The duration over which the force is applied is equally crucial, as it determines whether the resulting motion is perpetual or non-perpetual. Newton's second law, in the form presented as equation (37), neglects these factors and, as demonstrated in the introduction section, violates the law of conservation of energy. This violation is further supported by the Energy versus Distance plot derived from equation (3), as shown in Figure 3.

It is important to highlight again that, for an **open system**, Newton's expression of force as the product of mass and acceleration does not hold. Newton's second law of motion in the form

Force = Mass × Acceleration

It is valid only for thermodynamically closed systems, such as ideal gases under constant-volume conditions.

For example, consider one mole of an ideal gas heated at constant volume inside a cubic container with edge length L, volume $V = L^3$, and total surface area $6L^2$. As the temperature increases, the average velocity of the gas molecules also increases. This results in more collisions between the molecules and the container walls, increasing the pressure. According to the ideal gas law at constant volume, pressure is directly proportional to temperature:

$$\text{Pressure} \propto \text{Temperature (T)} \quad \ldots \quad (39)$$

[The ideal gas equation is, PV = RT, and when V is constant, P $\propto$ T, since the universal gas constant, R, is a constant, the value of the proportionality constant between P and T is (R/V)].

The expression of average velocity (v) of the molecules (mass of each = m) of an ideal gas is,

$$v = \sqrt{\frac{8RT}{\pi M}} \quad \ldots \quad (40)$$

So,

$$T = \left(\frac{\pi mv2}{8R}\right) \quad \ldots \quad (41)$$

So, putting the value of T as obtained from equation (41) into equation (40), one gets,

Pressure

$$= K x \left(\frac{\pi mv2}{8R}\right) \quad [\text{K the proportionality constant}] \quad \ldots \quad (42)$$

The value of the proportionality constant in equation (42) would be (R/V) as mentioned above,

Pressure = P = (R/V) x ($\pi mv^2/8R$)

$$\text{Pressure} = P = \left(\frac{R}{V}\right) x \left(\frac{\pi mv2}{8R}\right)$$

Or

$$P = \left(\frac{\pi}{8V}\right) xmv^2 \quad \ldots \quad (43)$$

Now, Force = (Pressure x total surface area of the gas cylinder)

$$= \left(\frac{\pi}{8V}\right) \text{x mv2 x } 6L^2$$

$$= \left(\frac{\pi}{8L3}\right) \text{x mv2 x } 6L^2$$

$$= \frac{3\pi}{4}\left[\frac{mv^2}{L}\right]$$

Retrieval Number:100.1/ijap.A107406010426
DOI:10.54105/ijap.A1074.06010426
Journal Website: www.ijap.latticescipub.com

Published By:
Lattice Science Publication (LSP)

$$= (\text{dimensionless constant x} \left(\frac{mv^2}{\text{L}}\right) \quad ... \quad (44)$$

Now the dimension of (v^2/L) is, [(L^2/ T^2 L) = LT^{-2} = dimension of 'acceleration' of Newton,

So, the generalised expression of force in a closed system of constant volume is, as is obtained from equation (44),

$$\text{Force} = \text{constant x mass x acceleration} \quad ... \quad (45)$$

However, Newton eliminated the proportionality constant in equation (45) by setting it equal to unity, but the justification provided for this simplification is neither clear nor convincing. It is important to note that the mathematical relationship in equation (45) is valid only for a closed system that exhibits ideal gas behaviour. Additionally, there is a physical limit to the increase in temperature ΔT \ TΔT in this scenario. Beyond a specific temperature, the system can no longer be considered closed—it will break down. Therefore, the force expressed as in equation (5), when applied to a closed system, can never reach arbitrarily high values that would cause the energy parameter to diverge toward infinity, thereby violating the law of conservation of energy.

IV. EINSTEIN'S SPECIAL THEORY OF RELATIVITY (STR)

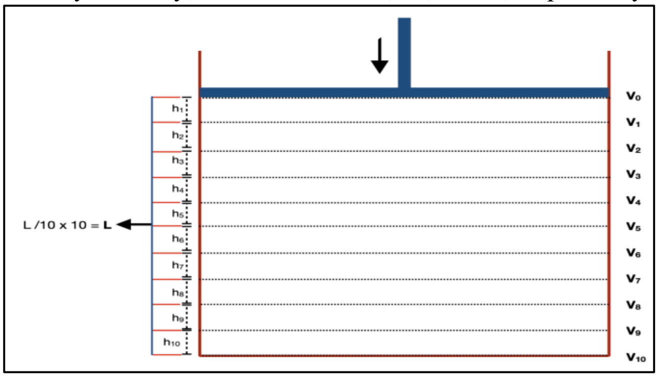
Einstein's Special Theory of Relativity (STR) [1As discussed in previous sections, [] also violates the law of conservation of energy. However, the forms of the equations Einstein developed for open systems—such as those describing relativistic velocity, time dilation, and length contraction—can be valid for an adiabatic (or isolated) system of ideal gases, and will be adapted accordingly in this work. The mathematical expressions for relativistic effects derived here for an isolated ideal gas system will differ in exact form from Einstein's original equations. Still, the functional relationships among the relativistic variables will be essentially the same. The mathematical equations proposed by Einstein for length contraction, time dilation, and the Lorentz factor, as already presented, are:

$$\text{L} = \left[\text{L0}\sqrt{1-\frac{V^2}{C^2}}\right] \quad ... \quad (46)$$

$$\text{t} = \left[\text{t0}\sqrt{1-\frac{V^2}{C^2}}\right] \quad ... \quad (47)$$

$$\Upsilon = \left[\frac{1}{\sqrt{1-\frac{V^2}{C^2}}}\right] \quad ... \quad (48)$$

The model of an isolated system is shown in Figure 5 below: Consider a cubic cylinder containing one mole of an ideal gas in an adiabatic environment with a movable piston attached, as shown in Figure 4. There is no heat exchange with the surroundings (i.e., the system is thermally insulated). Let the initial length of each side of the cylinder be L_0, and let the initial temperature, volume, and molecular velocity be T0, V0, and v0, respectively. Now, suppose the piston is moved (compressed) to various positions h_1, h_2, h_3, h_4…h_{10} as illustrated in Figure 5, such that the change in height at each position is constant: Δh = constant = (L/10). At each piston position, the temperature, total gas volume, and molecular velocity will vary; denote these as Ti, Vi, and vi, respectively.



[Fig.4: The Adiabatic Compression of an Isolated Thermodynamic System of an Ideal Gas in a Cylinder with a Movable Piston]

For each position of the piston, the two dimensions L_0 (the length and breadth of the cylinder) remain constant, while the height h_i changes. For any piston position, the mathematical relationship between the height h_i, L_0 and Vi is given by:

$$(L_0)^2 \text{ x hi}) = V_i \quad ... \quad (49)$$

$$V_0 = (V_0)^3 \quad ... \quad (50)$$

$$V_i = (1_{-i})\,(L_0)^3 \quad ... \quad (51)$$

Now, if the average length of the cylinder in each position is being considered to be $L_{i,\,av}$,

$$\text{Li, av} = \frac{(\text{ L02 x hi})1}{3} = \frac{(\text{Vi })1}{3} \quad ... \quad (52)$$

Now, in an adiabatic system,

$$\text{T1 V1Y} - 1 \quad = \quad \text{T2 V2Y} - 1 \quad = \text{constant}$$
$$= \text{K (say)} \quad ... \quad (53)$$

The average velocity (v_i) of the molecules is related to temperature (T_i) by the following equation of the kinetic theory of an ideal gas,

$$\text{vi} \quad = \sqrt{\frac{8\text{RTi}}{\pi\text{M}}} \quad ... \quad (54)$$

or, connecting to equation (50)

$$\text{vi} \quad = \sqrt{\left[\frac{8\text{R}\left(\frac{\text{K}}{\text{viY}}-1\right)}{\pi\text{M}}\right]} \quad ... \quad (55)$$

connecting to equation (49),

$$\text{vi} \quad = \sqrt{\left[\frac{8\text{R}\left\{\frac{\text{K}}{(\text{Li, av})3(\Upsilon-1)}\right\}}{\pi\text{M}}\right]} \quad ... \quad (56)$$

Or,

$$vi2 = \left[\frac{8R\left\{\frac{K}{(Li,av)3(\Upsilon - 1)}\right\}}{\pi M}\right] \quad ... \quad (57)$$

Or,

$$[\,Li,av]3(\Upsilon - 1) = \left[\frac{8RK}{vi2}\pi M\right] \quad ... \quad (58)$$

Or,

$$[\,Li,av] = (\,L02 \text{ x } hi)1/3$$
$$= [\,8RK/vi2\ \pi M\,]\left[\left(\frac{1}{3(\Upsilon - 1)}\right]\right. \quad ... \quad (59)$$

The relation between v_i and v_0 is, [as per equation (50)],

$$\left(\frac{vi}{v0}\right) = \sqrt{\frac{Ti}{T0}} \quad ... \quad (60)$$

Or,

$$(vi) = v0\sqrt{\frac{Ti}{T0}} \quad ... \quad (61)$$

The relation between T_i and v_i is (already shown above)

$$vi = \sqrt{\frac{8RTi}{\pi M}} \quad ... \quad (62)$$

Since it is being shown in this article, Tt =1, or t=time = (1/temperature)

$$vi = \sqrt{\frac{8R}{ti}\pi M} \quad ... \quad (63)$$

or,

$$ti = \left[\left(\frac{8R}{vi2\pi M}\right)\right] \quad ... \quad (64)$$

The summary of the derived equations is shown below vis-à-vis Einstein's STR.

$L = [L_0 \sqrt{(1-v^2/C^2)}]$ of STR versus derived here $[L_{i,\,av}] = (L_0^2 \text{ x } h_i)^{1/3} = [8RK/v_i^2\ \pi M]^{[(1/3(\Upsilon-1)]}$

$t = [t_0\sqrt{(1-v^2/C^2)}]$ of STR versus derived here $t_i = [(8R/v_i^2\pi M)]$

$\Upsilon = [1/\sqrt{(1-v^2/C^2)}]$ of STR versus derived here $(v_i) = v_0\sqrt{(T_i/T_0)}$

The empirical data for L, t, and v in the STR model—obtained from Equations (5) and (6), with the velocity of light (C) taken as 10, and L_0 as 100—along with values of v_i ranging from 1 to 10, are presented in Tables 2(a & b), 3(a & b), and 4. Correspondingly, the data for the current model—(L_{iav}, t_i, v_i) as derived from Equations (56), (60), and (51) respectively—are also shown in the same tables.

While calculating $L_{i,\,av}$ for the current model, the constant K has been assumed to be unity, the molecular weight M has been taken as 100, and the value of γ has been set to 1.66 (the value for an ideal monatomic gas). To calculate v_i for the current model, the reference temperature T_0 is set to 298 K, while the Ti values are 308, 318, 328, 338, 348, 358, 368, 378, 388, and 398 K, respectively.

Typical plots of L_i versus v_i and t_i versus v_i for both the STR model and the newly proposed model are shown in Figures 5 and 6, respectively. The plot of v_I versus T_i for the new model alone is shown in Figure 7.

Table VIII: Empirical Data v_i, T_i and $L_{i,\,av}$ of the Current Model Calculated from Equations (51) and (56) with Ti Values Taken as 308, 318, 328, 338, 348, 358,368, 378, 388 and 398, respectively, R Value Taken as 8.314 x 10^7 ergs

Ti (K)	v_i (m/s)	$L_{i,\,av}$
308	8.0751	0.0554
318	8.2052	0.0545
328	8.3332	0.0536
338	8.4593	0.0528
348	8.5835	0.052
358	8.706	0.0513
368	8.8267	0.0506
378	8.9458	0.0499
388	9.0634	0.0493
398	9.1794	0.0486

Table IX: Empirical Data of v Versus L of STR as Calculated from Equation (5) with L0 Value Taken as 100 and the Value C = 10 and vi Values Taken as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Velocity v	Relativistic Length L
1	99.5
2	98
3	95.39
4	91.65
5	86.6
6	80
7	71.41
8	60
9	42.43
10	0

Table X: Empirical Data of t_i Versus Velocity for the Current Model as Calculated from Equation (60) with R Value 8.314 x 10^7 ergs and M= 100 gm

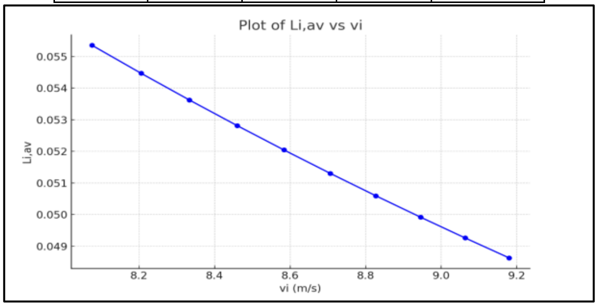
Ti (K)	vi (m/s)	ti (s)
308	255.36	0.003247
318	259.47	0.003145
328	263.52	0.003049
338	267.51	0.002959
348	271.43	0.002874
358	275.31	0.002793
368	279.13	0.002717
378	282.89	0.002646
388	286.61	0.002577
398	290.28	0.002513

Table XI: Empirical Data of Velocity (v) Versus Time of STR Calculated from Equation (6) with Value of C = 10 and v Varied from 1,2,3,4,5…9

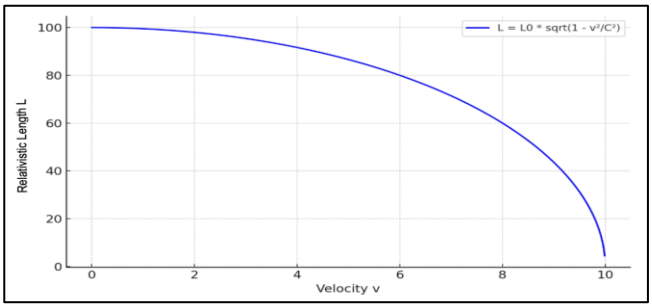
v (Velocity)	t (Relativistic Time)
1	0.995
2	0.98
3	0.954
4	0.917
5	0.866
6	0.8
7	0.714
8	0.6
9	0.436

Table XII: Comprehensive Empirical Data of vi, Ti, ti and L for the Current Model Being Shown Together as Presented in this Article

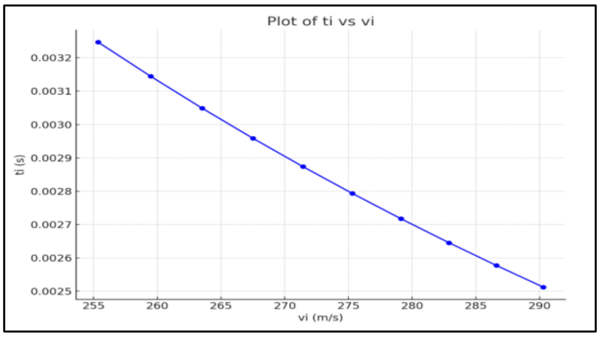
Sr. No.	Ti (K)	vi	ti	L
1	308	1.0166	0.2048	0.3457
2	318	1.033	0.1984	0.3402
3	328	1.0491	0.1924	0.335
4	338	1.065	0.1867	0.33
5	348	1.0806	0.1813	0.3252
6	358	1.0961	0.1762	0.3206
7	368	1.1113	0.1714	0.3163
8	378	1.1263	0.1669	0.312
9	388	1.1411	0.1626	0.308
10	398	1.1557	0.1585	0.3041



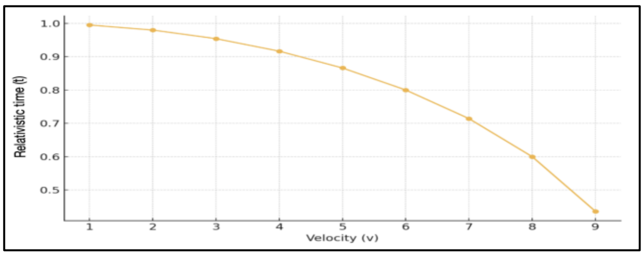
[Fig.5a: Plot of Li, av Versus vi of the Current Model (Data of Table 2a)]



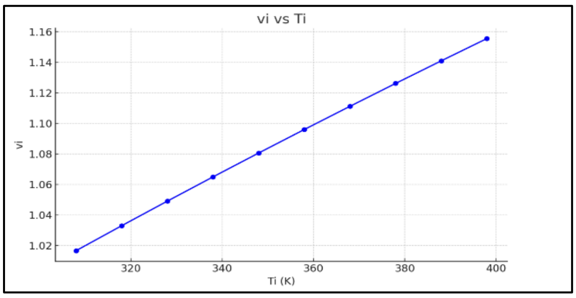
[Fig.5b: The Plot of Relativistic Length Versus Velocity of STR (Data of Table 2b)]



[Figure 6a: Plot of ti Versus vi of the Current Model (Data from Table 3a)]



[Fig.6b: Plot of Relativistic time Versus Velocity of the STR Model]



[Fig.7: Plot of v_i vs T_i (Based on Data of Table 4)]

Einstein's mass–energy equivalence equation, E = mC^2, however, violates the principle of energy conservation, as previously discussed in this article. For isolated systems, an alternative form of the equation can be derived—one that relates energy (E) to the differing average velocities of the molecules in an ideal gas, rather than to the velocity of light, as in Einstein's formulation.

From the plots of $L_{i,\, av}$ versus v_i in the current model, and of relativistic length (L) versus v in STR (Figures 5a and 5b, respectively), it is observed that, in the current model, the plots are linear, with $L_{i,\, av}$ decreasing monotonically as v_i increases. In contrast, the STR plot shows an exponential decrease. According to STR, relativistic length approaches zero as velocity approaches the speed of light. However, this is physically implausible: if length becomes zero in an inertial frame, the frame would undergo total collapse—resulting in zero volume, mass, energy, entropy, time, and so on—which is thermodynamically impossible. In the current model, by contrast, L_i asymptotically approaches a finite minimum value, determined by the limiting temperature of an adiabatic system.

Similarly, from the plots of t_i versus vi in the current model and of relativistic time t versus v in STR (Figures 6a and 6b, respectively), it is evident that time decreases monotonically with increasing velocity in both models. In contrast, in STR, relativistic time tends to zero exponentially—an outcome thermodynamically forbidden.

It must be emphasised that in our universe, *length* is the most fundamental physical dimension. All physical variables—volume, mass, time, entropy, energy—are ultimately derived from or dependent on length. If length were to vanish, the universe itself would cease to exist.

Thus, Einstein's STR may not be an appropriate framework for describing a universe in which mass and energy are conserved. In the closed systems examined in this article, relativistic phenomena such as length contraction and time dilation are valid but arise purely from mechanical constraints. Abstract constructs like "inertial frames," "rest mass," "relativistic length," "relativistic time," "relativistic mass," and the "twin paradox" are, in this context, not physically tangible propositions but rather theoretical artefacts lacking thermodynamic consistency.

Figure 7 shows that, assuming ideal gas behaviour, the velocity of gas molecules increases almost monotonically with temperature. When the real behaviour of baryonic matter—gases, liquids, and solids -is considered, the average translational kinetic energy of molecules increases with

Retrieval Number:100.1/ijap.A107406010426
DOI:10.54105/ijap.A1074.06010426
Journal Website: www.ijap.latticescipub.com

Published By:
Lattice Science Publication (LSP)

temperature, and consequently, the molecular velocities also increase. In the case of solids, while the molecules are not free to translate, the frequency of their oscillations about their mean positions increases with temperature. However, this increase in molecular velocities is never exponential.

This behaviour is a direct consequence of the mass–energy conservation principle that governs the universe. Special Relativity Theory (STR), by contrast, does not align with this thermodynamic reality, as it inherently violates certain thermodynamic principles.

The expression for *temperature* in relation to the average molecular velocity, as obtained from Equation (51), is:

$$T = \frac{[vi2 \times \pi \times m]}{8R} \quad \ldots \quad (65)$$

According to the principle of equipartition of energy, the total translational energy of one mole of an ideal gas at temperature T is given by:

$$E = \frac{3RT}{2} \quad \ldots \quad (66)$$

Now, putting the mathematical relationship of T in equation (62) with E, in equation (61), one gets,

$$\frac{2E}{3R} = \frac{[vi2 \times \pi \times m]}{8R}$$

Or,

$$E = 3\frac{[vi2 \times \pi \times m]}{2}$$

Or,

$$E = K \times m \times vi2 \qquad \left[K = \text{constant} = \left(\frac{3\pi}{2}\right)\right] \ldots \quad (67)$$

Or,

$$\text{Total translational Energy (E)} = \text{constant} \times \text{mass} \times (\text{velocity})^2 \quad \ldots \quad (68)$$

Einstein's equation is,

$$\text{Energy} = \text{mass} \times (\text{velocity of light})^2 \quad \ldots \quad (69)$$

While the form of Einstein's equation and the equation being derived now in equation (64) are about the same, they differ from each other as follows:

i. Einstein's equation is missing the proportionality constant K, and a proportionality constant should have been there.

ii. The velocity part of Einstein's equation is a constant, but in equation (64) it is a variable.

iii. Unlike Einstein's equation, equation (64) would never violate the principle of conservation of energy since vi can never attain an enormously high value for an adiabatic system. Though under compression, the temperature of an adiabatic system increases, the increase in temperature (ΔT) has a limiting value, beyond which the system would no longer remain adiabatic.

V. CONCLUSION

The following conclusions are being drawn:

A. Newton's equations of motion—relating velocity, distance, acceleration, and time—are not entirely tangible in physical reality. Firstly, the assumption of constant acceleration is not generally valid, especially in open systems. Secondly, these laws do not explicitly account for the energy parameters involved in the motion of macroscopic objects within such systems. When energy is evaluated independently, and one attempts to compute the distance (SSS) as a function of time and acceleration using Newton's equations, and then determine the force (F = mass × acceleration), it leads to a contradiction: the resulting energy (calculated as the product of force and distance) tends toward infinity. This outcome violates the law of conservation of energy and implies a scenario akin to perpetual motion, which is physically impossible.

B. Equations closely resembling Newton's equations of motion—relating distance, velocity, acceleration, and time—are derived in this article for closed thermodynamic systems of ideal gases. However, unlike Newton's original formulation, the equations in this new model do not violate the conservation of energy because they include a parameter ΔT(temperature change), which has a limiting value for closed systems. Consequently, none of the parameters—distance (S), velocity (v), force (F), or acceleration (f)—can reach infinite values. Therefore, Newton's equations of motion apply only partially: his assumption of constant acceleration is incorrect, and his simplification of the proportionality constant between force and change in momentum to unity—ignoring temperature—is not valid. These classical equations are better suited to describe the motion of microscopic particles in an ideal gas, and even then, only within a closed system.

C. Einstein's Special Theory of Relativity (STR) predictions—such as relativistic length contraction, time dilation, relativistic velocity, inertial frames of rest and motion, and the Lorentz factor—are not entirely valid propositions. This is because STR fundamentally violates the conservation of energy, effectively representing perpetual motion. However, like Newton's laws of motion, STR may still apply to some extent, though not wholly, primarily to isolated or adiabatic systems of ideal gases, where the limitations of both theories overlap.

The new findings presented in this article are poised to prompt the global scientific community to reconsider and reshape traditional paradigms in physics.

DECLARATION STATEMENT

This research article is dedicated to the memory of the brilliant scientific personality, the late Professor Albert Einstein.

As the article's author, I must verify the accuracy of the following information after aggregating input from all authors.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures

that the research is conducted with objectivity and without any external influence.

- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** Each author has individually contributed to the article. Dr Chinmoy Bhattacharya conceived and led the research, developed the analytical framework, and performed all derivations and data analyses. Nishant Sahdev assisted in the interpretation of results, literature review, and manuscript preparation. Both authors reviewed and approved the final manuscript.

REFERENCES

1. Campanelli, Mario, ed. (2020) "Newton's laws." In *Classical Mechanics: A professor–student collaboration*, pp. 2-1. Bristol, UK: IOP Publishing. https://iopscience.iop.org/book/edit/978-0-7503-2690-2/chapter/bk978-0-7503-2690-2ch2
2. Liu, M.S. Xie , H.S. Wang , Y.M. et al (2024) " ENN"'S road map for proton-boron fusion based on spherical tours "physics of Plasmas, 31(6),062507. https://doi.org/10.1063/5.0199112
3. Blanco, Philip (November 2019). "A discrete, energetic approach to rocket propulsion". *Physics Education*. **54** (6): 065001. https://ui.adsabs.harvard.edu/abs/2019PhyEd..54f5001B
4. Olughu, O. U. (2021, April). Energy efficiency and conservation. In *IOP Conference Series: Earth and Environmental Science* (Vol. 730, No. 1, p. 012026). IOP Publishing. https://iopscience.iop.org/article/10.1088/1755-1315/730/1/012026/meta
5. Bera, M. N., Riera, A., Lewenstein, M., Khanian, Z. B., & Winter, A. (2019). Thermodynamics is a consequence of information conservation. *Quantum*, *3*, 121. https://quantum-journal.org/papers/q-2019-02-14-121/

AUTHOR'S PROFILE

Nishant Sahdev is a distinguished researcher and a student of Dr Chinmoy Bhattacharya, serving as a Research Fellow at Austin Paints & Chemicals Pvt. Ltd. His work, based on quantum gravity, cosmology, and dark matter, contributes to the development of a unified quantum gravity theory and an innovative space quantisation model.

Dr. Chinmoy Bhattacharya earned his PhD in Polymer Physics in 1988 and completed postdoctoral research on liquid-crystal polymers at Laval University, Canada. Returning to India in 1991, he joined ICI India Ltd. and later founded his own paint company. He is a former chairman of the Indian Paint Association and a leading figure in India's paint industry. Bhattacharya's research spans quantum gravity, cosmology, and dark matter, culminating in a unified quantum gravity theory and a novel space quantisation model. He has numerous publications in prestigious journals, including his work on a new initiator for free radical polymerisation, published in Polymer Chemistry (Royal Society of Chemistry, DOI: 10.1039/COPY00180E). As a guest faculty member at the University of Calcutta, he teaches Colour Physics, Polymer Physics, and Coating Rheology to postgraduate students, continuing to inspire the scientific community.

SUPPLEMENTAL DATA

Appendix

Table V: Data Table of Figure 1

Time	Distance	Work Done
0	0	0
0.101	0.01	0.102
0.202	0.041	0.408
0.303	0.092	0.918
0.404	0.163	1.632
0.505	0.255	2.551
0.606	0.367	3.673
0.707	0.5	4.999
0.808	0.653	6.53
0.909	0.826	8.264

Table VI: Data Table of Figure 2

Mass (kg)	Energy $E = mc^2$ (Joules)
1	9×10^{16}
2	1.8×10^{17}
3	2.7×10^{17}
4	3.6×10^{17}
5	4.5×10^{17}