

## **The Wrong Kinetic Energy**

A research paper

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### **ABSTRACT**

**There is a difference between kinetic energy and field energy in modern physics; a situation that was troubling to Albert Einstein. Kinetic energy has its roots in the metaphysical thinking of Gottfried Leibniz -whose  $MV^2$  formula has been confirmed by Emilie du Chatelet who contradicted Sir Isaac Newton and her contemporary French physicists. Beyond the metaphysical origins the classical formula of kinetic energy has critical errors in its reduction. The controversial origins and the questionable mathematical reduction of our concept for kinetic energy demand a serious re-evaluation of our natural philosophy regarding energy by motion.**

# The Wrong Kinetic Energy

## INTRODUCTION

Late in his life Albert Einstein made intriguing observation about the difference between field energy and kinetic energy. He wrote:

“Kinetic energy and field energy appear as essentially different things. This appears all the more unsatisfactory as, according to Maxwell’s theory, the magnetic field of a moving electric charge represents inertia. Why not then the *whole* of inertia? Then only field energy would be left, and the particle would be merely a domain containing an especially high density of field energy. In that case one could hope to deduce a concept of mass point together with the equations of motion of the particles from the field equations –the disturbing dualism would have been removed.” [1]

Kinetic energy is relatively new term. Before 1849 it was called Quantity of Motion. Back then there were actually *two different* Quantities of Motion in use: one British –by Sir Isaac Newton, and one German –by Gottfried Leibniz, that has been confirmed by one French courtesan named Emilie du Chatelet who was mentored by her lover, the Genius of Mockery, Voltaire himself.

Today in our natural philosophy the same two elements –Mass and Velocity, are producing *two very different quantities* in moving bodies –momentum and kinetic energy. That is counterintuitive; one might even call it absurd.

## TWO QUANTITIES OF MOTION

The “evolution” of the above Quantities of Motion includes the theories of Sir Isaac Newton and of Gottfried Leibniz. After bitter arguments during the 1840s –the time of Joule among others,

the  $\frac{1}{2}$  coefficient was introduced and added to Leibniz's formula then the quantities were renamed as Momentum and Kinetic Energy.[2]

The original Quantity of Motion was  $MV$  –or the product of mass and velocity.[3] The quantity was defined by Sir Isaac Newton. It is easy to reproduce and the work done by this quantity is easy to measure with one unit velocity compared to double and triple velocities.

The second Quantity of Motion was  $MV^2$  –or the product of mass and velocity squared. This was the idea of Leibniz and he based his opinion on the metaphysical *vis viva controversy*. Both Newton and Leibniz were dead by the time Emilie du Chatelet and Voltaire had their so called *scientific period* at Cirey in the castle of Emilie's husband between 1734 and 1749. Emilie believed that Newton's calculation was wrong. In her writings she sided with the metaphysics of Leibniz and stated that  $MV^2$  was the correct Quantity of Motion.[4] By doing that she almost heretically contradicted Sir Isaac Newton and her contemporary French scientists.

## **THE FIRST MAN-WOMAN SCIENTIFIC ARGUMENT IN HISTORY**

Emilie published the results of an experiment where a small copper ball was sent down onto soft clay floor.. She wrote: If the sphere was sent down with double and triple velocity it pushed *four times and nine times deeper into the clay* than before. Thus  $MV^2$  was the correct Quantity of Motion! She published arguments on behalf of Leibniz and *forces vives* in 1740. Jean-Jacques Dortous de Mairan, the Permanent Secretary of the Academie Royale de Sciences publicly protested on March 4, 1741. He very politely reminded Emilie to read his *Dissertation sur l'estimation et la mesure des forces motrices du corps. (Published in 1728)* In her response to Mairan Emilie du Chatelet managed to ridicule his position. The entire incident is described in detail in Emilie's latest biography.[5]

## VOLTAIRE'S ROLE AS "MENTOR"

After publishing his "Lettres Philosophiques" new warrant had been issued for Voltaire's arrest in May 1734.[6] To escape his arrest Voltaire fled Paris and found refuge with the Marquise Emilie du Chatelet in Cirey at the castle of her husband who moved to his hunting lodge. Voltaire –already rich and famous playwright, renovated the castle and openly lived with his new lover, Emilie.

Together they turned their attention to science. Their so-called *scientific period* lasted fifteen years, from 1734 to 1749 when Emilie died. Voltaire acted as mentor to Emilie whose work influenced scientific thinking and the fundamentals of physics beyond expectations.[7]

The most important and intriguing document by Voltaire from their scientific period is a letter he wrote to Henri Pitot on June 20, 1737. In his letter he wrote that: "I now have to abandon Mairan's idea that the quantity of movement in a falling body is  $MV$  and accept instead the idea that it is  $MV^2$ ." [8]

Surprisingly enough the historic argument between Newton and Leibniz has been decided upon by the Marquise Emilie du Chatelet, lover of the master comedian Voltaire -who supported her "scientific findings" quietly but forcefully from his role as Emily's mentor.

Emilie's results are impossible to reproduce. In a control experiment a small wooden sphere was dropped into room temperature water from 4 in. then 16 in. and 36 in. to secure speed values of one unit then double and triple relative velocities hitting the surface of the water. The small wooden sphere penetrated the water at a ratio of depth of one and two then three units. The Quantity of Motion in the falling object is proven to be the Newtonian  $MV$ . (Water has been used to secure *uniform density of target medium* – that is difficult to do with clay.)

As the result of the French couple's activity –from around 1737, ten years after Sir Isaac died there were two Quantities of Motion;  $MV$  and  $MV^2$  for over a century...

## ERRONEOUS REDUCTION

During the 1840s –the time of Joule, Helmholtz and others, after bitter arguments finally a “correction” was made to the German-French Quantity of Motion. The  $\frac{1}{2}$  coefficient has been introduced and the resulting formula,  $\frac{1}{2}mv^2$  was called Classical Formula of Kinetic Energy – while Sir Isaac Newton's original and correct Quantity of Motion was renamed as Momentum.

The  $\frac{1}{2}mv^2$  formula was reduced from Newton's Second Law of Motion:  $\mathbf{F} = m\mathbf{a}$ . The reduction –unfortunately, has critical errors. Kinetic energy is expressed as Work done by a Force applied during *acceleration* –as it is demonstrated in the following

$$(1) \quad \mathbf{W} = \mathbf{F} \, d\mathbf{s} = m \, d\mathbf{v}/dt \, v \, dt \quad [9]$$

This reduction & arrangement has a *critical error*.

$\mathbf{F}$  is being correctly expressed as  $m \, d\mathbf{v}/dt$ .

However the path element,  $d\mathbf{s}$ , is expressed *incorrectly*. The  $v \, dt$  formula is for *uniform motion*. For uniform *accelerating* motion the path element should be expressed as:

$$(2) \quad d\mathbf{s} = \mathbf{u} \, t + \frac{\mathbf{a}}{2} \, t^2 = \frac{1}{2} (\mathbf{u} + \mathbf{v}) \, t$$

Where:

$d\mathbf{s}$  is the displacement –or path element

$\mathbf{u}$  is the initial velocity

$\mathbf{a}$  is the uniform acceleration

$\mathbf{v}$  is the final velocity

$\mathbf{t}$  is the time

Therefore the reduction became a *mixture* of accelerating motion and uniform motion inherent in the arrangements and the logic of the formula -thus all steps following that error are *invalid*.

Furthermore, following the erroneous arrangement, containing both acceleration and uniform motion, the square of velocity was formed as follows:

$$(3) \quad v dv \dots\dots d(v^2)$$

Since the change of velocity ( $dv$ ) may have an infinite number of values -this arrangement is valid only *for accelerating motion and for doubled velocity*. It is valid numerically only if:

$$(4) \quad dv = v$$

## THE CLASSICAL FORMULA OF KINETIC ENERGY

The reduction made during the 1840s had left out the *negative changes in velocity* -when one object *decelerates from its original velocity* (and  $dv$  may have negative values) therefore as it is, the squaring of the velocity in the reduction **violated the rules of squaring**. The right correction would have removed the **false exponent** -instead of adding the erroneous  $\frac{1}{2}$  coefficient.

The “classical formula” of kinetic energy first appeared in one book by Gustave-Gaspard de Coriolis in 1829. [10] He calculated the quantity of movement –still defined as *force vive*, after a collision of two bodies. His result  $\frac{1}{2} mv^2$  was not the definition rather it was the *calculated quantity of movement after that collision!*

Two decades later a new term was born. William Thomson, later Lord Kelvin, is given the credit for coining “kinetic energy” around 1849. The quantity of movement after a collision -calculated by Gaspard de Coriolis in 1829, became a stand-alone *definition* for kinetic energy as  $\frac{1}{2}mv^2$  and remained the “Classical Formula” ever since...

## SPACE AGE PROBLEM WITH KINETIC ENERGY

Let us suppose two *identical space craft* programmed to “land on fire” on Mars. One space ship is programmed with Momentum while the other space ship is programmed with kinetic energy.

Momentum and “kinetic energy” are expected to become *zero* at the same moment. However they are not becoming zero at the same moment. The formula for kinetic energy is producing *VIRTUAL ENERGY* in the moving space craft then the formula must “compensate” for that extra, virtual inertia with a longer-than-necessary deceleration period.[13]

In other words: two identical space craft with identical mass and identical velocity will have two different burning cycles during deceleration. The rocket engine that is programmed with kinetic energy will burn longer-than-necessary! [11]

## CONCLUSION

Emilie’s published writings that  $MV^2$  was the right quantity of movement, had cemented the *dualism of quantities attached to moving bodies*. There were two Quantities of Motion for over a century until the 1840s -when the  $\frac{1}{2}$  coefficient was introduced to correct the  $MV^2$  formula. Unfortunately the classical formula of kinetic energy is still based on Leibniz’s metaphysics and its reduction has erroneous steps resulting in an *invalid and false formula* -for what we call today kinetic energy.

There is only one Quantity of Motion –or **energy** in modern terminology, attached to moving bodies and that is Sir Isaac Newton’s original quantity: **MV**. Nothing else can be measured and produced with moving objects. Kinetic Energy should be expressed as  $E_K = MV$  and *the so-called Classical Formula of Kinetic Energy should be eliminated from our natural philosophy.*

**LEGEND OF REFERENCES:**

[1] Albert Einstein: *Autobiographical Notes*, 1949, page 35. Trans.-Ed. Paul Arthur Schilpp, Open Court Publishing, Albert Einstein Archives, Jewish National University Library, Jerusalem, Israel.

[2] **Evolution of Quantities of Motion for One Unit Mass if Velocities are:**

	<b>One Unit</b>	<b>Double</b>	<b>Triple</b>	<b>Formula</b>
<b>Newton</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>MV</b>
<b>Leibniz*</b>	<b>1</b>	<b>4</b>	<b>9</b>	<b>MV<sup>2</sup></b>
<b>The 1840s**</b>	<b>0.5 (!!)</b>	<b>2</b>	<b>4.5</b>	<b>1/2mv<sup>2</sup></b>
<b>21<sup>st</sup> Century***</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>MV</b>

\*Confirmed by a courtesan, Emilie du Chatelet, and her lover Voltaire -the “Genius of Mockery”

\*\*No actual name attached to the reduction of the so-called Classical Formula of kinetic energy

\*\*\*Control experiment devised by author -using wooden sphere and water as target medium



[3] Sir Isaac Newton: *Principia*, 1687, Definition II.

[4] Emilie du Chatelet: *Institutions de Physique*, Paris 1740, p 446

[5] **Judith P. Zinsser: *La Dame d'Esprit: A Biography of Marquise Du Chatelet* Penguin Books**

See at: [books.google.com](https://books.google.com) keyword: Mairan

[6] Encyclopaedia Britannica. 15<sup>th</sup> ed. (Encyclopaedia Britannica Inc. 1974) See: Voltaire

[7] Thomas Hankins: *Science and the Enlightenment* (Cambridge University 1985) 2<sup>nd</sup> chapter.

[8] Ira O. Wade: *The Intellectual Development of Voltaire*. (Princeton University Press, Princeton, New Jersey, 1969) p. 366.

[9] Herbert Goldstein: *Classical Mechanics*. (Addison-Wesley Publishing Company 1980) p. 3

[10] Gaspard de Coriolis: *Du calcul de l'effet des machines, ou Considérations sur l'emploi des moteurs et sur leur evaluation* (1829) p. 130 - 131

[11] Rocket motor burning cycles in comparison -calculated with Momentum versus Kinetic Energy:

**With Momentum:**

Approach velocity:	7,000 meter/sec
Vehicle Weight:	1,000 kg -or 1 ton
Vehicle Momentum:	7,000,000 kgm/s
Fuel Annihilated:	5 kg/s
Fuel Exit Velocity:	4,000 meter/sec
Fuel Momentum:	20,000 kgm/s

**Burning Time Until Zero Momentum/Landing: 350 seconds - or 5 min 50 sec.**

**With Kinetic Energy:**

Approach Velocity:	7,000 meter/sec
Vehicle Weight:	1,000 kg -or 1 ton
Vehicle Kinetic Energy:	24,500,000,000 kgm <sup>2</sup> /sec <sup>2</sup>
Fuel Annihilated:	5 kg/s
Fuel Exit Velocity:	4,000 meter/sec
Fuel Kinetic Energy:	40,000,000 kgm <sup>2</sup> /sec <sup>2</sup>

**Burning Time Until Zero Kinetic Energy/Landing: 612 seconds - or 10 min 12 sec.**

As demonstrated in the above simplified comparison “kinetic energy” is causing the rocket

motor to burn longer-than-necessary thus creating danger especially if one would want to land a space craft “on fire”.