

Title

The world is ONE, physics too

Ok, this guy is making a statement.

Abstract

This article builds on the ontological and operational foundations established in our previous work submitted to Foundations of Physics ("The O of Système-O: Substituting Mass with a Count of Existences", 2026), where the elementary unit O and its measurement protocol were formally defined. The present manuscript focuses exclusively on the universal reformulation of classical equations once mass — a human-constructed parameter absent from the universe's own language which expresses only forms, speeds, and dynamical relations — is replaced by O. Here we demonstrate its operational use in the systematic rewriting of classical physical equations.

Traditional quantities — mass, weight, density — depend on medium, gravity, or material composition and therefore cannot serve as universal foundations. Replacing mass with O in Newton's laws, kinetic energy, momentum, and work yields formulations independent of gravitational or material context. This reveals a simpler and more coherent structure of physical laws, supports the unicity of physics developed throughout the article, clarifies the conceptual motivation for Système-R, a forthcoming work devoted to universal dynamic geometry.

Introduction

Classical physics relies on quantities whose definitions vary with medium, gravity, or material properties. Mass, in particular, is the last human-centric quantity—taking multiple forms (inertial, gravitational, relativistic) that reflect its contextual nature rather than a universal magnitude. Système-O replaces it with O, an elementary unit of existence, making physics finally ontological and restoring a single, context-independent quantitative foundation.

1.1 Relation to the foundational Système-O manuscript

The ontological status of O, the axioms of Système-O, and the operational protocol for obtaining integer counts N_O were established in our previous manuscript ("The O of Système-O: Substituting Mass with a Count of Existences", 2026) The present article does not repeat those foundations. Instead, it examines the consequences of substituting mass with O in classical mechanics, showing that the structure of the equations remains invariant while their interpretation becomes universal.

In that previous article, we introduced the quantity of existence O, defined as a universal magnitude independent of medium, gravity, and material nature; its formal definition is recalled in the appendices of this work.

The present article focuses on its operational use: rewriting classical equations by substituting mass with O , preserving their mathematical structure while revealing their universal form. We examine the limitations of traditional quantities, present the transformation method, apply it to fundamental mechanical relations, and discuss the conceptual consequences.

Section 1 — Limitations of Traditional Quantities

Mass, weight, and density vary with medium, gravity, material state, and experimental conditions.

Their contextual dependence prevents classical physics from expressing its laws in a universal language.

Mass illustrates this limitation clearly: its different forms are adapted to specific contexts rather than expressing a single universal magnitude.

A universal physics requires a quantity independent of medium, gravity, and matter.

Section 2 — Method for Transforming Equations

Replacing mass m with the quantity of existence O does not modify physical laws; it rewrites them in a universal language. The equations retain their structure, but their quantities change in nature: a local magnitude is replaced by a universal one.

The quantity of existence O is the universal measure of what exists as a form. It depends neither on material composition nor on density nor on gravitational context. Operational aspects—conversion, rounding, uncertainties—are detailed in the appendices.

The transformation follows three steps:

1. Identify the dependence on mass in the classical equation.
2. Replace mass m with the quantity of existence O .
3. Rewrite the equation so that all quantities are expressed in universal units.

This procedure preserves dimensional consistency by construction: O is defined precisely to replace mass in all dynamical relations.

2.1 – Statut du pont conventionnel

Although the fundamental equations of Système- O are expressed solely in universal units, an interface with human units remains necessary for experimental practice. This interface — the conventional bridge — has no physical significance. It links an ontological unit (O), defined within the universal framework of the theory, to an anthropic unit (kg), defined by SI convention.

The bridge plays no role in the fundamental equations and does not influence their structure or interpretation. Its function is purely practical: it enables measurements performed in human units to be translated into the universal formalism of Système-O.

Section 3 — Application to the Fundamental Equations of Mechanics

The substitution $m \rightarrow O$ rewrites the fundamental equations of mechanics in a universal language. Their structure remains unchanged; their interpretation becomes independent of material or gravitational context. Classical equations thus become universal expressions relating only form, velocity, and quantity of existence.

3.1 — Momentum

In classical mechanics, momentum is defined as

$$p = mv$$

Replacing mass with the quantity of existence yields

$$p = Ov$$

The relation preserves its structure, but its meaning changes: momentum is no longer tied to a local material property but to a universal magnitude. Motion becomes a geometric property of a form endowed with a quantity of existence O .

3.2 — Kinetic Energy

Classical kinetic energy,

$$E = \frac{1}{2}mv^2$$

becomes, in Système-O,

$$E = \frac{1}{2}Ov^2$$

Energy is no longer defined from a local mass but from a universal magnitude. A numerical example illustrates this transformation.

Numerical example

A form has an **existence quantity**

$O=12$

It moves with a **velocity**

$v=3 \text{ m/s}$.

The **universal kinetic energy** is then :

$$E = \frac{1}{2}Ov^2 = \frac{1}{2} \times 12 \times 9 = 54$$

This value depends neither on material composition nor on density nor on gravitational context; it expresses only the universal relation between velocity, form, and quantity of existence.

3.3 — Newton's Second Law

The fundamental relation

$$F = ma$$

becomes

$$F = Oa$$

Force is no longer the effect of a local mass subjected to an interaction, but the effect of a change in velocity applied to a quantity of existence. Newton's law retains its form but becomes independent of matter and gravity.

3.4 — Work and Energy

Classically, the work of a force is

$$W = F \cdot d$$

Using the universal form of force, we obtain

$$W = Oa \cdot d$$

This expression shows that work is not tied to a material mass but to the geometric variation of a form possessing a quantity of existence.

Section 4 — Conceptual Consequences of the Substitution $m \rightarrow O$

The substitution of mass m by the quantity of existence O does not modify any of the four fundamental equations of mechanics; it reveals their universal structure. Classical mechanics then appears as a special case of a more general language, where quantities no longer depend on matter, medium, or gravity, but only on form, velocity, and quantity of existence.

This shift may seem unnecessary from a short-term operational standpoint, since the classical equations already function. Yet its conceptual impact is substantial: it exposes the implicit assumptions embedded in the traditional formulation of mechanics and clarifies which elements belong to the physical world and which belong to human modelling.

In particular, the substitution brings to light the long-standing two-world framework that has shaped classical and relativistic interpretations—one world for inertial behaviour, another for gravitational behaviour. This dual structure has been treated as if it reflected nature itself, whereas it is an artefact of our historical modelling choices. The unified formulation obtained through O leaves this dual-world framework behind, because it does not correspond to any physical necessity.

By restoring a single descriptive layer grounded in universal quantities, the substitution $m \rightarrow O$ opens the way for new concepts, new invariants, and new forms of dynamical reasoning.

It prepares the transition toward a unified physics grounded in our reality of One World, in which geometry and dynamics are expressed in a single language, setting the stage for the development of Système-R.

Clarification on the role of the conventional bridge

The substitution $m \rightarrow O$ operates entirely within the ontological layer of the theory. The conventional bridge to the kilogram plays no role in this substitution. It is required only for interfacing human measurements with the universal formalism. All universal equations — momentum, force, kinetic energy, work — are written exclusively in O and remain unaffected by the choice of bridge. The universality of the formulation therefore does not depend on any anthropic convention.

4.1 — Delocalization of Dynamics

In the classical formulation, mechanical quantities are defined from a local property: mass.

In Système- O , they are defined from a universal magnitude.

Dynamics ceases to be a property of matter; it becomes a property of form in motion.

4.2 — Unification of the Laws

The four fundamental equations retain their structure:

- $p=Ov$
- $F=Oa$
- $E = \frac{1}{2}Ov^2$
- $W=Oa \cdot d$

This invariance shows that mechanics does not rest on mass, but on the relation between velocity, acceleration, displacement, and quantity of existence.

Mass was only a contingent way of expressing these relations.

4.3 — Universality of the Quantities

Mechanical quantities become independent of:

- material composition,
- density,
- gravitational context,
- scale.

They no longer describe a particular object, but a form possessing a quantity of existence.

Mechanics becomes a universal language applicable to any dynamic form.

4.4 — Reinterpretation of Force

Force is no longer the effect of a mass subjected to an interaction, but the effect of a change in velocity applied to a quantity of existence.

It becomes a geometric, non-material magnitude.

Conclusion

This work does not introduce new physical laws. It reveals the universal structure already implicit in classical mechanics once mass is replaced by the ontological unit O defined in our foundational manuscript. Together, the two articles provide a coherent framework: the first establishes the ontology and measurement protocol, while the present one demonstrates its conceptual consequences for the unity of physical laws.

Appendix A - Conventional bridge

This appendix defines the purely conventional mapping between the universal unit O and the anthropic unit kg . It lies entirely outside the ontological core of Système-O and must not be used in axioms or fundamental equations.

The unit O is ontological: it belongs to the universal descriptive layer of Système-O. The kilogram is anthropic: it is defined by human convention within the SI system. No physical principle relates O to kg . Any mapping between them must therefore be conventional.

Elementary Table

Symbol	Name	Definition
O	Elementary unit	Elementary indivisible unit of existence ($1 O$)
Q_o	Quantity of existence	$Q_o = N_o \cdot O$
O_s	Osilo scale	Human convenience scale: $1O_s = 10^{12}O$
kg	Kilogram reference	Conventional human unit; see Appendix A

The Osilo scale

For practical use, a human-scale intermediate unit is introduced:

$$O_s = 10^{12} O$$

This choice has no physical meaning. It is selected because it produces values of convenient magnitude for laboratory-scale measurements. Smaller exponents would yield impractically small numbers; larger exponents would yield impractically large ones.

Conventional bridge: $1 kg = (O_s)^3 = 10^{36} O$. This mapping is not derived from physical principles; it is a purely conventional scaling choice external to the ontological core.

The Cubic relation

The kilogram is mapped to the cube of the Osilo scale:

$$1 kg = (O_s)^3$$

The exponent 3 has no physical significance. It is simply the **smallest integer exponent** that produces a human-scale reference unit when combined with $1O_s = 10^{12}O$. Lower exponents fail to reach the kilogram range; higher exponents overshoot it. The cubic relation is therefore the **minimal functional choice**.

Derivation of the factor 10^{36}

From the definitions above:

$$1 kg = (10^{12} O)^3 = 10^{36} O$$

The value 10^{36} is not chosen; it is **mathematically determined** by the Osilo scale and the cubic bridge. It has no physical meaning and does not appear in the ontological structure of the theory.

Alternative values, $10^{30} \cdot 10^{40}$, would require redefining the Osilo scale and would break the human-scale structure of the system without adding any physical insight.

The value 10^{36} is simply the **unique value compatible** with:

- the Osilo scale $10^{12} O$,
- the cubic bridge,
- and the requirement of human-scale practicality.

Conversion rule: For a measurement x in kilograms, $N_0 = x \cdot 10^{36}$.

This conversion is strictly conventional and external to Système-O. It does not influence the universal equations, which are written solely in O .

Appendix B - Data templates and example records

Measurement record template

Record A-001

Method: *conventional balance reading*

Primary reading: 0.004237 kg

Conversion used: Appendix A

Converted value x in O : $4.237 \times 10^{33} O$

Rounded value \tilde{N}_O : $4.237 \times 10^{33} O$

Residual: ΔN_O : 0

Instrument uncertainty U_{instr} : $1 \times 10^{29} O$

Decision: noncritical

Comments: residual within instrument uncertainty

Record B-010

Method: spectrometric particle proxy

Primary reading: $2.3456 \times 10^{18} O$

Conversion used: none (instrument outputs directly in O)

Converted value x in O : $2.3456 \times 10^{18} O$

Rounded value \tilde{N}_O : $2.3456 \times 10^{18} O$

Residual ΔN_O : 0

Instrument uncertainty U_{instr} : $5 \times 10^{14} O$

Decision: noncritical

Comments: rounded to nearest integer

Record C-100

Method: assembly of three components measured separately

Primary readings:

- $\text{comp1} = 1.0 \times 10^{-12} \text{ kg}$
- $\text{comp2} = 2.0 \times 10^{-12} \text{ kg}$
- $\text{comp3} = 3.0 \times 10^{-12} \text{ kg}$

Converted values in O:

- $\text{comp1} = 1.0 \times 10^{24} O$
- $\text{comp2} = 2.0 \times 10^{24} O$
- $\text{comp3} = 3.0 \times 10^{24} O$

Rounded values: identical to converted values

Residuals: 0

Instrument uncertainty $U_{\text{instr}} : 1 \times 10^{20} O$

Additivity: confirmed

Total: $6.0 \times 10^{24} O$