The Ontology of Physics:
Why Everything is Motion

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Abstract

This essay proposes a fundamental revision of the ontological foundations of physics. The traditional distinction between 'object' and 'motion' is identified as an artificial byproduct of our linguistic structure. By shifting the perspective from motion as a property of matter to matter as a configuration of motion, a consistent framework emerges in which physical laws are not empirical accidents but logical necessities. The essay concludes that physics is not the study of 'things' but the pure study of dynamics.

Keywords: ontology of physics, motion, conservation laws, fundamental entropy, quantum of action, transaction costs, systemic logic, mass-motion equivalence.

1 The Grammar of Reality

Humanity views the world through the lens of language. At school, we learn grammar: a sentence consists of a subject, a verb, and nouns. However, this structure teaches us something more fundamental than mere correct sentence construction. It reveals that we instinctively perceive reality in terms of **objects, actions, and properties**.

In the development of physics, we see a striking parallel. The discipline began with the study of an action: the movement of objects through space and time. For a long time, it was believed that rest was the natural state and that motion always required an external force — an assumption that closely aligns with our daily language, in which an object (subject) must "do" something (verb). It was Galileo who ultimately concluded that rest and constant velocity both express the same equilibrium: the absence of a disruptive interaction.

2 The Illusion of Empirical Law

Not long after, Newton followed with his laws ($F = ma$ and $F_{ab} = -F_{ba}$). In almost every textbook, these are presented as empirical laws, after which the student practices endlessly to gain routine. This methodology obscures the inevitable structure behind these laws from view.

In mechanics, the object of study is not the thing, but the **motion**. The properties of that motion — momentum (p) and energy (E) — are used in every domain of physics. Yet, momentum is often introduced late as a convenient "tool" for collisions. This is a pedagogical oversight. Physics should be defined from the very first lesson as the study of motion.

It is no coincidence that we have exactly two measures for motion: momentum (p) and energy (E). These arise directly from the geometry of our spacetime. Momentum is the quantification of motion in space, while energy is the quantification of motion in time. Because we describe motion within this framework, these two quantities are the inevitable accounting units of the system.

3 System Characteristics and Conservation

The laws of physics are essentially the laws of the logic of exchange. This is a purely **structural system characteristic**. Suppose we have a conserved quantity X in a closed system. If the value of X for object a changes, this change *must* be compensated by an opposite change in object b.

$$\Delta X_a + \Delta X_b = 0 \implies \Delta X_a = -\Delta X_b$$

This principle is universal and applies, for example, to money in a closed economy. In physics, that quantity X is momentum or energy. What we call a "force" (F) in everyday language is nothing more than the rate at which this momentum is exchanged between objects:

$$F = \frac{\Delta p}{\Delta t}$$

Newton's laws are therefore not arbitrary discoveries, but the inevitable accounting rules of a universe that conserves motion. Newton's laws are nothing other than the bookkeeping rules of this interaction.

Mathematical derivations, such as those by Emmy Noether, later confirmed this, but they are in fact tautologies; they demonstrate the internal consistency of the language we had already chosen. Symmetries in space and time are therefore not the *cause* of the laws, but the *consequence* of the requirement that motion remains conserved.

4 An Ontology of Pure Motion

This leads us to a deeper insight: physics is a study of **second-order effects**. Constant motion requires no explanation; only the *change of the change* (the interaction) is the object of study.

But an even more fundamental conclusion is possible. The separation between the "object" and the "motion" is an artificial distinction arising from our linguistic structure. At the deepest level, there is no static subject performing an action. What we call an object is itself a manifestation of motion. After all, mass can be converted into massless radiation and vice versa. If mass were fundamentally distinct from motion, how could it emerge from pure motion or dissolve into it entirely? For an ontology to be consistent, mass must therefore be understood as a specific configuration of motion.

5 The Quantum of Action

If everything is motion, the question arises whether there exists a smallest unit of motion. Modern physics finds this in Planck's constant (h). This constant defines the *quantum of action*. Since action is the unit of momentum multiplied by distance (or energy multiplied by time), h represents the minimum granularity of interaction. The world is not continuous but constructed from discrete units of motion.

6 Entropy: The Price of Interaction

While fundamental forces such as gravity are frictionless and path-independent, thermodynamics dictates that every real process incurs friction. Within a bookkeeping model of conservation, friction is the inevitable **transaction cost** of interaction. A system without these costs would be a perpetual motion machine — a theoretical ideal that does not exist in reality. Instead, these costs accumulate within the system as an increase in entropy.

This principle is fundamental to the structure of physical laws: motion optimizes itself by minimizing these transport costs. What we perceive as the laws of space and time — such as following paths of minimum time or distance — is essentially the macroscopic manifestation of this ongoing optimization. The laws of nature are the inevitable outcome of a system striving for order through the most efficient distribution of motion.

7 Conclusion

Physics must abandon its pretense of being a collection of discrete phenomena and recognize itself as the pure study of dynamics. Objects are merely stable patterns in a continuous flow of momentum and energy exchange. When we teach a student that $F = ma$, we are not teaching them how dead matter reacts to a push, but how one form of motion transforms into another. There are no things that move; there is only motion that we interpret as things.

This approach shows that physics does not rest on complex mathematical theories that happen to describe reality, but on an inevitable systemic logic. Once we view the world as a dynamic system of interaction and conservation, the laws of thermodynamics force upon us the structures we observe. The laws of nature are not arbitrary; they are the necessary outcome of a universe striving for a minimum transport cost for its motion.

In this context, mathematics is not the driver, but the language of accounting. The real discovery is not the formula $F = ma$, but the insight that change in a closed system is necessarily an interaction between two poles, where the formation of order (matter) is balanced by the price of friction (entropy). It is the transition from a qualitative grammar (subject-verb) to a quantitative logic of conservation and optimization.

The deepest conclusion is therefore that physics is not a collection of facts to be discovered by merely looking outward, but a framework that we can understand internally by reasoning through the logic of motion. All else are merely manifestations of this one, all-encompassing principle: everything is motion, and motion is conserved.

A Appendix: Paradigmatic Shift in Physical Ontology

- **The Primacy of Motion**
  Traditional physics operates under the paradigm of the "object" and the "force" acting upon it. This ontology dissolves the distinction between object and motion: the object *is* a manifestation of motion. The quantification of motion in space and time through the equivalent quantities of momentum and energy demonstrates that mass, much like velocity, is fundamentally a measure of motion.

- **Conservation as an Axiom**
  When we postulate the conservation of motion, Newton's laws and the symmetries of physical laws follow directly. Noether's derivation of conservation laws from symmetries is, in this context, tautological, as it indirectly relies on the structure of Newton's laws. Without conservation, there is no Newton; without Newton, there is no Noether. Conservation is the logical source, not the consequence.

- **Force as Transaction**
  Force and action are not abstract fields, but the physical transfer mechanisms of motion—momentum and energy—between different configurations.

- **Entropy as Fundamental**
  Entropy is not a secondary thermodynamic phenomenon, but a fundamental property of interaction. Every transfer of motion requires a transport cost, which increases entropy. The arrow of cosmic time is not determined by probability, but by the inevitable increase of these transaction costs.

- **The Quantum of Motion**
  There exists a smallest unit of motion. This follows immediately from the existence of a smallest quantum of energy: if energy is the measure of motion, then quantized energy dictates a necessarily quantized dynamics.