the general science journal
The General Science Journal. April 2026.

Two fundamental laws for all sciences

Antonio León Sánchez

Retired Professor. Independent researcher in the foundations of science.

Abstract.-This article proposes two fundamental laws for all sciences: the Fundamental Law of Logic and the Fundamental Law of Natural Sciences. From both of these, it is possible to formally deduce other statements that have hitherto been regarded as independent fundamental laws, as well as new findings not yet considered by contemporary science.

Keywords: Fundamental Law of Logic, Theorem of Identity, Fundamental Law of Science, Theorem of the Consistent Universe, Corollary of the of the Physical Laws, Theorem of Formal Dependence, Theorem of Uncertainty.

1. Introduction

A common feature of the current state of science is the careless use of both everyday language and formal language in the expression of scientific theories. The situation is particularly serious in the field of physics, as T. Maudlin has already pointed out, for example with the following words that I often quote [4, p. xiv]:

> Unfortunately, physics has become infected with very low standard of clarity and precision on foundational questions, and physicists have become accustomed (and even encouraged) to just "shut up and calculate" to consciously refrain from asking for a clear understanding of the ontological import of their theories.

One might expect the situation to be less serious in the more mathematized branches of physics, but the opposite is true: in these fields, certain concepts are used in an unacceptable manner, as is the case, for example, with points and instants of the spacetime continuum: they are very often treated as if they could be adjacent and have a non-zero extension (duration). Which, of course, is impossible: between any two points (instants) there is always the same uncountable infinite number ($2^{\aleph_o}$) of other different points (instants), so that, for example, a line one-billionth of a millimeter long has as many points as the entire observable three-dimensional universe; or one-millionth of a second as many instants as the entire history of the universe (13.800 million years). Inevitable consequences of the actual infinity that underlies contemporary mathematics, the mathematical language of physics. An actual infinity whose formal inconsistency, on the other hand, can be formally demonstrated [2, 1].

This state of formal immaturity in scientific theories is closely related to the fact that these theories overlook the inevitable infinite regress of arguments, definitions, and causes. Indeed, it is possible to formally demonstrate the need that all sciences have for primitive concepts, primitive propositions, and primitive causes. These needs have not yet been considered in the case of primitive concepts and causes, and have been considered (at least since Aristotle) in the case of primitive propositions (axioms and fundamental laws), but with great disorder and a high level of redundancy.

This article proposes two fundamental laws—or principles—of universal validity for all sciences: one of a formal and abstract nature, and the other of an inductive and empirical nature. From each of these, certain results are formally deduced that contemporary science regards as independent fundamental laws or principles. The number of such fundamental laws or principles is thus reduced, making scientific theories somewhat less arbitrary and more formal.

2. Preliminary definitions

The problem with the most basic definitions is that they must necessarily be circular. The alternative would be a potentially infinite sequence of definitions, which is even worse because one could never arrive at a final definition. Therefore, every science should declare its primitive concepts, which are neither defined nor definable in non-circular terms. Here we will use two of these primitive concepts (always referring to the scientific theories with which we attempt to explain the observable universe):

Definition 1 (of Proposition) *Any* STATEMENT *about any aspect of physical reality, or about the theoretical objects that make up scientific theories.*

Definition 2 (of Physical Object) *Any* PART *of the observable universe that has, or may have, its own motion through the real and absolute physical space.*

The suspicion that both concepts are of a primitive nature is based on the inevitable use of the object defined in the definition, albeit with different words: proposition / statement; object / part.

3. The Fundamental Law of Logic

Although there are other forms of logic, such as fuzzy logic, in which a proposition can be true in a certain percentage and, at the same time, false in another percentage, here we will limit ourselves to classical logic, in which propositions can only be true or false. This logic continues to form the formal basis of the experimental sciences and most of mathematics. The three fundamental laws of logic can be reduced to a single fundamental law, in which the second and third laws are meaningfully merged, and the first law is formally deduced from this single fundamental law of logic:

Fundamental Law of Logic: *A proposition can only be true or false, and it cannot be both true and false at the same time*:

$$(P \vee \neg P) \ \wedge \ \neg(P \wedge \neg P) \tag{1}$$

Where P is any proposition defined in accordance with Definition 1. As the reader will have recognized, this Fundamental Law of Logic encompasses both the third ($P \vee \neg P$) and the second $\neg(P \wedge \neg P)$ of the classical laws of logic in a single, meaningful sentence. It is now straightforward to prove the following theorem, which states the same claim as the classical formulation of the first law of logic:

Theorem 1 (of Identity) *Every object, whether formal or physical, is identical to itself.*

Proof.-Suppose that an object A is not identical to itself. A would have some property X that A does not possess. Consequently, A would imply both a proposition and its negation:

$$P : A \text{ has the property } X \tag{2}$$

$$\neg P : \neg(A \text{ has the property } X) \tag{3}$$

Therefore:

$$A \implies (P \wedge \neg P) \tag{4}$$

which violates the Fundamental Law of Logic (1). Therefore, every object, whether formal or physical, is identical to itself. □

4. The Fundamental Law of Science

For about four years now, and under the name "Principle of the Directional Evolution of the Universe," I have been proposing an extension of the Second Law of Thermodynamics that should be applied to all sciences, and for which there is overwhelming empirical evidence. I propose it here as the fundamental law of all empirical sciences (Astronomy, Biology, Chemistry, Geology and Physics):

Fundamental Law of Science.-*The observable universe evolves independently of its rational observers and through causal changes in the direction of increasing its global entropy.*

The independence of rational observers in the evolution of the observable universe is fully justified because, for most of that evolution, no rational observers existed in the universe; and even now, when they do exist, these observers cannot observe everything that exists and evolves in the observable universe. It is also reasonable to propose that evolution requires changes, and that changes require causes to produce them, for which there is overwhelming empirical evidence, the same evidence that exists with respect the irreversible increase in the global entropy of the universe. Regarding this last point, I often recall the example of the champagne bottle: the gas released when uncorking a bottle of champagne will never spontaneously and completely return to the same bottle of champagne from which it emerged.

It is worth noting that this directional evolution of the universe is consistent and compatible with the emergence of open systems (such as living organisms) that exchange matter and energy with their environment, such that entropy decreases within them and increases in their environment, resulting in a net increase in the overall entropy of the universe. That said, let us prove the following results, all of which I have proved in other works:

Theorem 2 (of the Consistent Universe) *The observable universe evolves under the control of a unique set of unchanging and consistent natural laws.*

Proof.- If the natural laws governing the evolution of the universe were not a unique set of unchanging and consistent natural laws, changes in the universe would occur with similar frequencies in all directions, and no significant progress would be possible in any of those directions. Therefore, the evolution of the universe in a single direction (that of increasing its global entropy) would be impossible, which contradicts the Fundamental Law of Science. Consequently, the universe evolves under the control of a unique set of unchanging and consistent natural laws. □

Corollary 1 (of the Natural Laws) *The natural laws apply in the same way in all directions and regions of space and time.*

Proof.- This is a direct consequence of Theorem 2 of the Consistent Universe, and then of the Fundamental Law of Science. □

Note that the Corollary of the Physical Laws states exactly the same thing as the Principle of Uniformism-Actualism, which was proposed and accepted by 19th-century naturalists [3]:

> Principle of Uniformism-Actualism: *The laws of nature are the same in all places and times.*

Theorem 3 (of Formal Dependence) *No proposition proves itself; no concept defines itself; no object, process, or cause is the cause of itself.*

Proof.-If propositions could prove themselves, then any proposition P and its negation $\neg P$ could prove themselves, which goes against the Fundamental Law of Logic $\neg(P \wedge \neg P)$, in which case consistent sets of laws would be impossible, which contradicts Theorem 2 of the Consistent Universe and then the Fundamental Law of Science. If concepts defined themselves, their meanings would be inaccessible to human knowledge, and they could not be used to establish the natural laws that we can only establish through those concepts, which also contradicts Theorem 2 of the Consistent Universe, and then the Fundamental Law of Science. If objects, processes, or causes were the cause of themselves, then anything could exist and any process could happen, so that the directional evolution of the universe would be impossible, which contradicts the Fundamental Law of Science. □

Comment: Note that the fact that a concept cannot be defined in terms of itself is quite different from the fact that the concept is accepted as a primitive concept for which no formal definition is available. And the same is applicable to propositions and causes.

Theorem 4 (of Uncertainty) *In a consistent universe, every branch of human knowledge must be based on unproved propositions, undefined concepts, and unexplained causes.*

Proof.-In a consistent universe, propositions do not prove themselves, concepts do not define themselves, and causes are not the causes of themselves (Theorem 3 of Formal Dependence). Therefore, no proposition P can be used to prove the same proposition P, otherwise P would be a proposition that proves itself (Theorem 3 of Formal Dependence). Thus, the proof of proposition P can only be a sequence of propositions all of them different from P. This sequence must be finite and have a first proposition, otherwise the proof could not be completed. Furthermore, this first proposition must be unprovable, because if it were provable, it would not be the first proposition of the sequence of propositions that proves of P. A similar argument applies to definitions and causes. □

Obviously, the above Theorem 4 of Uncertainty is the reason why all sciences require axioms or fundamental laws whose truth is accepted without proof. On the other hand, and as noted elsewhere by the author, the consequences of the Theorem 4 of Uncertainty on human knowledge are inevitable and far more general and significant than those imposed by Gödel's Incompleteness Theorems, or by Heisenberg's Uncertainty Principle. According to Theorem 4 of Uncertainty, human knowledge in any field must be based on an initial set of undefined terms and arbitrary assumptions and causes.

Bibliographical References

[1] A. León Sánchez. *Infinity put to the test*. Amazon's KDP, 2023 (2021). PDF.

[2] A. León Sánchez. The Axiom of Infinity Is Inconsistent. *The General Science Journal*, 2024. PDF.

[3] Charles Lyell. *Principles of Geology*. Penguin Books, 1997.

[4] Tim Maudlin. *Philosophy of Pysics. Space and Time*. Princeton University Press, New Jersey, 2015.