

NOTHINGNESS AND THE PHYSICAL SPACE

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Abstract.-This short article discusses why the word nothing should not be used in the sense of something, as is done in certain physical theories that propose the formation of universes from fluctuations of nothing. The discussion is based entirely on the basic laws of logic and a physical principle of the highest empirical evidence.

Keywords: Principle of Directional Evolution, Theorem of Formal Dependence, indefinite regress, nothingness, something, physical space, first cause, primitive cause.

1 A First Cause?

The statement of the Theorem of Formal Dependence [p. 69][7] is so reasonable that it could be proposed as a fundamental axiom in all formal and experimental sciences. But, even better, it can be formally and immediately deduced from an inductive principle, which, indeed, would have to be assumed as a fundamental principle in all physics (it is already assumed by thermodynamics under the name of the Second Law), it is the following:

Principle of Directional Evolution: The universe evolves always in the same direction of increasing its entropy.

where entropy can be exchanged for isotropy, since the former can be formally defined in terms of the latter [4]. Appendix A of this article includes the proof of how, in effect, the following theorem follows immediately from the Principle of Directional Evolution:

Theorem of Formal Dependence: No concept defines itself; no proposition proves itself; no object is the cause of itself; and no cause is the cause of itself.

This, of course, implies that the universe, as such a physical object, is not the cause of itself, and that, consequently, it must be explained by a first cause external to the universe itself. A first cause that cannot be explained by other causes deduced from our knowledge of the universe itself. It could be called a primitive cause, as is the case with primitive concepts, which cannot be defined without falling into circular definitions (Aristotelian indefinite regress [1, I.3]).

2 “Nothing” should not means “something”

All languages are polysemantic to varying degrees. In general, the different meanings of a word belong to the same family of meanings (related meanings). However, care must be taken when using polysemantic terms because the First Law of Logic may be violated if the context does not clarify the meaning used. But what should never happen is that the same word is used with two opposite meanings. In such cases, as will be seen below, the Second Law of Logic is inevitably violated.

Unfortunately, there is at least one family of these self-contradictory words in physics: nothing-something.

They are also very close to being, or in fact are, primitive concepts whose clean and independent meaning is almost impossible to establish without falling into circular definitions. In such cases, the USE of such words must be clearly established. Sometimes it will be convenient to give relative definitions of semantic pairs, such as alive = not dead / dead = not alive; nothing = not something / something = not-nothing.

But this is not yet the case, and in the scientific literature we can read things as [3, p. 7 (Kindle Ed.)]:

P0: *Nothing* is in everything as material and physical as *something* is, especially if it is defined as the *absence of something*.

what is said (written) with the intention of being able to affirm later that universes can be born spontaneously from nothing, a very frequent affirmation in the literature of contemporary physics. But *nothing* can have no capacities or properties, otherwise it becomes *something* with those capacities or properties. For example, *something* with the ability to spontaneously create universes. Although we still have the right to ask ourselves what is the cause of this *nothing* with the capacity to spontaneously create universes.

Actually, and with the same semantic right, **P0** can be paraphrased, for example, as:

Dead is in everything as material and living as *living* is, especially if it is defined as the *absence of living*.

which, although not necessary, can be divided into two sub-sentences:

P1: *Dead* is in everything as material and living as *living* is,

P2: especially if it is defined as the *absence of living*.

This clearly violates the Second Law of Logic:

Dead \implies living (By **P1**)

Dead \implies \neg living (By definition **P2**)

The same applies to the couple nothing-something according to **P0**

P3: *Nothing* is in everything as material and physical as *something* is,

P4: especially if it is defined as the *absence of something*.

which also violates the Second Law of Logic:

Nothing \implies something (By **P3**)

Nothing $\implies \neg$ something (By definition **P4**)

This shows the inconsistency of assigning opposite meanings to the same word. In reality, and as has just been pointed out above, using the word “nothing” with the meaning given in **P0** is a semantic trick (conscious or unconscious) to escape from the Theorem of Formal Dependence, or in other words, to escape from the inescapable necessity of a first cause that cannot be explained by other causes (indefinite regression of causes, as Aristotle would say [1, I.3]). It seems advisable, therefore, to propose an international agreement establishing the use of certain key terms in scientific language, making it clear that a word cannot have contrary meanings, on pain of violating the Second Law of Logic, as we have just seen.

3 The physical space

The concept of space does not have a comfortable position in modern physics either. Most physicists still believe that space is not something real, but a mere fiction useful for establishing certain relations between real physical objects [2]. At the same time, they think that it can expand, deform, and vibrate. What they do not explain is how something that does not exist can, for example, vibrate. On the other hand, as is well known, in 2014–2015 the existence of gravitational waves was fully confirmed: transverse quadrupoles propagating at 299792.458 Km/s and deforming (albeit very weakly) the arms of the interferometers that detect them. These empirical deformations of ordinary matter produced by gravitational waves prove that space is not a fiction but a real physical entity: what does not exist has no empirically detectable properties. There is, therefore, a space matter different from ordinary matter and dark matter [6].

It makes no sense, then, to speak of empty space, or of space as nothingness. Such a nothingness does not seem to exist in our universe (as some Greeks already thought). Everything, from sidereal space to intra-atomic space, must be filled with the above mentioned space matter. A substance that is gravitationally and frictionally inert, i.e. transparent, to ordinary matter (“Principle of Inertia”) and on the contrary is altered by the presence of ordinary matter (“gravitational fields”). It may be related to dark energy, but not to dark matter, since it is not gravitationally inert to ordinary matter. In any case, and from now on, to explain the origin of the universe must also explain the origin of space matter. And to solve certain problems related to its alleged expansion [5]. Perhaps it would be interesting to consider other options for the universe, such as those related to

holograms or cellular automata.

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Appendix A

Principle 1 (of Directional Evolution) *The universe evolves always in the same direction of increasing its entropy.*

Definition 1 (of Consistent Set of Laws) *A set of physical laws is consistent if under the same conditions it always leads to the same results.*

Theorem 1 (of the Consistent Universe) *The universe evolves under the control of a unique set of invariant and consistent physical laws.*

Proof.-If the physical laws governing the evolution of the universe were not an invariable set of consistent laws, changes would occur with equal frequency in all directions, and no progress would be possible in any of them. Thus, directional evolution would not be possible, which violates the principle 1 of directional evolution. Thus, the universe evolves under the control of a unique set of invariant and consistent physical laws. \square

Theorem 2 (of Formal Dependence) *No concept defines itself; no statement proves itself; no physical object is the cause of itself; and no cause is the cause of itself.*

Proof.-If concepts could define themselves, their corresponding definitions would be inaccessible to our formal and experimental sciences, so the Theorem 1 would not hold, and the Principle 1 would be impossible. If propositions could prove themselves, then everything could be proved, and then sets of consistent laws would be impossible, which violates the Theorem 1. If physical objects and causes were the cause of themselves, then they would have attributes unknowable to human reason and nothing could be proved about them, which also violates Theorem 1. \square

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