

Top-down Causality – the missing link in our physical theories

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Abstract:

Confining is a top-down effect. Particles have to be confined in a region if these are to bond together. Gravity plays the required double role: it confines and bonds. Gravity confines the universe as a single unit and prevents it from disintegrating into its constituents. Thus the universe 'as a whole' has a distinct identity; it controls everything inside it. So there is a strong top-down causal effect inside the universe. The present day physics, however, ignores this crucial factor. Recognizing this 'missing link' is essential to get a complete picture of the physical world.

Key words: causality, event/process/phenomenon, bonding/confining, chaos/order, probability/determinism, evolution/creation, natural selection, hierarchical levels, ultimate-complexity.

1. Introduction:

Causality is defined as the relation between cause and effect. Causality explains why a certain *phenomenon* happens – explains 'the conditions that lead to that phenomenon' and also explains 'why under those conditions, it does not happen in the reverse direction'. The concept of causality is based on the following assumptions: (i). Everything can be explained based on *causal logic* (ii). The explanation is correct if it is devoid of *logical fallacy*.

Physicists normally bring out bottom-up causal explanations for all phenomena. So they argue that causality is essentially bottom-up. However, in this paper, I propose that bottom-up causality is impossible in the absence of its counterpart, top-down causality. To strengthen the proposal, the top-down causal factor present in the universe is identified. The present bottom-up explanations are incomplete; there are many gaps. Moreover, these contain 'logical errors'. Incorporating top-down causal factors removes the logical errors, and fills some (if not all) gaps.

2. Hierarchical explanation of the physical world:

Our bottom-up explanations are hierarchical, visualizing top, bottom and intermediate levels. Any phenomenon is explained in a bottom-up way by identifying the events and processes, and also the causal factors at each level starting from the very bottom. However, at present, the top (the phenomenon explained) is just a 'net result' of what lie at the bottom; it has no other relevance and has no distinct role of its own. What I propose is an explicit acknowledgement of the existence of top as an entity different from the constituents. The top exists as a 'whole' and the constituents exist as 'parts'; the whole affects the parts and the parts affect the whole.

Based on the hierarchical view, the causal effects at any given level can be classified as top-down, same-level or bottom-up. If the 'whole' affects the 'parts', then causality is top-down. If the part affects the whole, then causality is bottom-up. If the part affects the part, then causality is same-level. Causal factors lead to events, events lead to processes and processes lead to phenomena. In this context, we have to define the terms event, process and phenomenon, and examine the directions in which these proceed.

An *event* is a change in a certain direction, top-down, same-level or bottom-up. In a bottom-up event, the entities bond together. In a same-level event, the entities move from one position to another position. In a top-down event, the entities break the bond between them. An event requires only one causal factor, but the direction of the event does not imply that the causal factor has the same direction.

Any *process* is a sequence of events. All events in a process need not have the same direction, but the process may have an overall direction. A process thus requires a number of causal factors, a suitable combination of bottom-up, same-level and top-down causalities. A *phenomenon* may involve a single event or a single process or a sequence of processes. It will have an overall direction, bottom-up, same-level or top-down, but all the events and all the processes involved in it need not be in the same direction.

An event is thus the smallest bit of information regarding a phenomenon. 'All the events' and 'all the causal factors behind these events' put together gives a clear picture of the phenomenon.

3. Causal factors behind integration:

Integration takes place by way of *bonding*. However, particles have to be confined in a region for bonding. Causality is a bottom-up in bonding, but top-down in *confining*. Bonding is impossible without confining, or bottom-up causality will not work in the absence of top-down causality. Thus confining is crucial for integration. Confining implies that particles are not independent, but behave as constituents of a system.

It is the real forces, that is, the forces of nature, that is responsible for bonding and confining; forces thus play a double-role. Confining is basically a process of a body confining itself. This confining nature is very obvious in the case of gravity and is acknowledged by physicists. But the distinction between bonding (a bottom-up effect) and confining (a top-down effect) is ignored.

The confining nature of force can be explained in a new way^[1] as follows: motion is a fundamental property of matter; force is reaction to motion; the reaction prevents straight-line motion, and confines matter in a closed path. Or, force confines matter in addition to bonding. In a body like Earth, the bonding forces create chains of atoms, and gravity confines these chains into a mass with a force towards the center. 'G' is very high for bonding-gravity^[2] and very low for confining-gravity.

4. The in-built three-way Causality:

Motion confers same-level causality to particles. As a reaction to motion, force emerges, and along with that confining and bonding emerges, or top-down and bottom-up causalities emerge as a pair. Thus the three-way causality is inbuilt in matter at the most basic level. Due to same-level causality, particles move. Top-down causality restricts this motion and confines the particles in a given region. Bottom-up causality bonds them.

Bottom-up and same-level causalities together try to create changes (events), but top-down causality by confining tries to prevent changes (events). The net result is that the number of possible events gets reduced. This restrictive nature of top-down causality

imparts it different roles. During integration, top-down causality decides the next-level structures at each stage and thus decides the final structure, and once the final structure is formed, it decides what happens inside that structure.

5. Chaos vs order; probability vs determinism:

If bottom-up and same-level causalities are prominent, most of the structures formed will be unstable, and so formation and disintegration of structures repeat again and again, making the system *chaotic*. Here, nearly all changes are reversible, but in the few cases where structures formed are relatively stable, the changes are not easily reversible. Here, the confining force prevents disintegration; that is, top-down causality acquires some prominence in selected cases.

If the three causalities are equally prominent, the system will be neither orderly nor chaotic; it will be a combination of the two. Nearly all structures formed will be equally stable, and so any change will require continuous triggering, and by reversing the direction of triggering, the change can be reversed. So there will be maximum diversity and complexity in the system.

If top-down causality is prominent, the system becomes orderly and stable. The system does not disintegrate. Any change that happens will not affect its structure, and so such changes will not continue infinitely. So changes will be cyclic, creating an infinite loop. In the absence of top-down causality, there is no confining; the entities become independent and do not behave as a system. Chaos/order can exist only in systems.

If a system is chaotic, the events will be more *probabilistic* than deterministic. If it is orderly, the events will be more *deterministic* than probabilistic. If it is a combination of chaos and order, the events will also be a combination of probability and determinism. The presence of top-down causality ensures that a chaotic system ultimately becomes orderly; so, chaos exists only at the bottom levels of orderly systems.

6. Changes in a system – Evolution vs Creation:

Due to the in-built causality, events (changes) will be happening ceaselessly inside a system. The events may be bottom-up, same-level or top-down. Irrespective of the direction of events, the phenomenon can be regarded as an *evolution*, if the causal factors remain within the system. If any causal factor remains outside, the phenomenon can be regarded as a *creation*; the external agency evokes top-down causality and creates 'something' in the system. Conventionally, the terms 'evolution' and 'creation' are used in a positive sense, to represent cases where *events* lead to bottom-up *phenomena*. To avoid confusion, the same convention is followed hereafter.

In a bottom-up phenomenon like evolution/creation, basic units integrate into new structures having somewhat different properties. The new structures act as new entities and not as a mere collection of basic units. These emergent properties can be explained based on the basic properties and the now acquired structures. These properties give the structures different causal powers, and there lies the difference between structures.

A top-down causal power perpetuates the bonds inside the structure and thus preserves it as an entity. The absence of top-down causal power leads to the disintegration of the structure, and hence all structures that survive will invariably have top-down causal powers. A bottom-up causal power leads to further bonding with other structures, and a same-level causal power breaks some such bonds leading to a variety of structures. If bottom-up causal power is missing, evolution/creation comes to a dead-end. If both bottom-up and same-level causal powers are absent, the structure becomes independent.

It is the emergent properties that decide which structures emerge out of the vast number of possible structures. Emergence is thus a selection process guided by top-down causal factors. In the case of creation, the creator selects the suitable structures; in the case of evolution, it is *natural selection*. Natural selection is thus a process guided by top-down causal factors; however, this crucial role of top-down causality is rather ignored by the main-stream at present.

7. Integration of fundamental particles – an evolution:

The integration of fundamental particles is an evolution because the causal factors are in-built. The evolution leads to emergent structures having new properties. Some of these structures will be relatively stable. The top-down causal effect due to stability prevents disintegration, and these become the selected structures of that level. These structures integrate into larger structures, and these again integrate into still larger structures. This continues until a single unit (system) encompassing all is formed. We call this unit 'the universe', and inside it, we have a hierarchy of physical structures.

The above phenomenon is bottom-up and involves natural selection where only the relatively stable structures survive at each level. Natural selection can happen only if there exists the possibility to form all possible structures, and for this particles have to be confined. Without this top-down causal effect (confinement), even the relatively stable structures will disintegrate, and the process of integration will get aborted. The top-down causal factor that guides the above evolution is the 'confining' nature of gravity.

8. Hierarchical levels in the physical world:

In the physical world, five distinct *hierarchical levels* can be identified.

- (i). Particles
- (ii). Atoms (made up of particles)
- (iii). Masses (made up of atoms)
- (iv). Orbiting systems (made up of masses)
- (v). The universe (made up of orbiting systems)

Here, the particles remain at the very bottom, the universe at the very top and 'masses' at the middle level. It may be noted that none of these structures are model-dependent. Model-dependent structures like fields alone, masses containing dark matter, antimatter, etc. and multiverses become necessary just because of the model, and these become unnecessary once that model is rejected. However, whatever be the model of universe put forth, the existence of the above hierarchical structures has to be accounted for.

9. The universe at the very top:

Since it is natural selection that leads to the emergence of universe from fundamental particles, and since at every step of selection, relative stability is the factor that counts, it can be logically assumed that the universe is very stable. As it is the end-state of the evolution, it will not have any bottom-up or same level causal powers. It has only top-down causal powers, and will be independent. That is, the structure of the universe is such that it does not have any motion or force; motion and force remain within it as the properties of galaxy-clusters, which are 'confined' together as a system by gravity.

The universe is not a mere collection of particles, it is an entity in itself. It cannot revert back into its constituents, and the constituents can no more act in an independent manner; the top decides what the constituent parts can do. A strong top-down causality ensures perfect order inside it and every phenomenon depends on this dominant factor. However, our present-day mainstream theories do not recognize this crucial factor. Top-down causality is thus the missing link in our theories.

The top-down causal power of the universe makes it stable. So the changes in the universe cannot go infinitely in any direction; changes will be cyclical in which the structure of the universe does not change. Thus based on causal factors, I argue that the universe remains pulsating^[3]; expansion of the universe is a finite process and it will be followed by contraction.

10. Causal possibilities in the mid-level structures:

The mid-level structures (masses like Earth, Moon, Sun, etc.) are made up of atoms. There are nearly 120 different elements and these interact using electrostatic, magnetic and gravitational forces. Gravity is always attractive and the other two are both attractive and repulsive. So the number of possible ways these atoms can remain bonded inside the masses is very large. Thus diversity is maximum in the mid-level. Comparing this with the levels below and above it, it can be seen that there is no such diversity inside 'atoms' or inside 'orbiting systems of masses'.

At the middle level, all three causalities are equally relevant. So a combination of chaos and order exists at this level. As explained, in such a situation, the structures formed are equally stable, and using a suitable triggering agent, any change can be reversed. This leads to diversity and complexity. So it is no wonder that complex living organisms including humans inhabit masses. The emergence and existence of life, and our ability to create machines depend on the causal possibilities present in the mid-level structures.

11. Evolution/creation of life:

Life emerged in the universe from inorganic matter as a result of *evolution*. This is a bottom-up phenomenon; the causal factors are in-built in matter and it involves natural selection. The evolution continued, leading to complex organisms having brain structures, and ultimately humans, who are capable of analyzing what matter is. Thus matter attains a state of self-realization, and this may be the limit of evolution, the *ultimate complexity* that matter can achieve.

Life emerges in an already-existing system having top-down causal powers. So in addition to the inbuilt three-way causality of atoms, the top-down causal factors due to the hierarchical levels above atoms are also involved in the process, the most crucial being the top-down causality of the universe. As far as Earth is considered, this top-down causal effect is external, or the emergence of life is a *creation*. Universe creates life on Earth, and selects which emergent life-form should exist at each stage. So, there should be a strong co-relation between the state of the universe and the life-form present.

12. Humans as creators:

We belong to mid-level structures (structures made up of atoms). Most of the things that we create are also mid-level structures. Most of the mid-level structures are somewhat stable, but the stability can be disrupted by applying a suitable triggering force. It is this causal possibility that makes it possible for us to create things by reshaping the structure. The top-down causality of the universe decides which mid-level structures can be formed at any given time.

Creation is a bottom-up phenomenon that involves a number of processes, each involving a number of events. Each event happens as a result of a causal factor which may be bottom-up, same-level or top-down. But the overall direction of the process depends on the top-down causal effect applied by us. We can create only the allowed structures; we as well as our creations are allowed structures at this period (expanding phase).

13. Logical fallacies in the present concepts:

The 'Standard Model' contains an implicit assumption that particles (fields) are confined – a top-down causal effect – enabling interaction. If we argue that there is no need for such an assumption and particles can interact without confining, then our argument becomes illogical. If we accept that there is such an assumption, it will destroy the model, because any top-down causal effect will lead to a deterministic end, reducing the number of particles to a very few, and the so-called fundamental particles (61 as at present) will turn out to be possible permutations of those few. The situation thus constitutes a clear case of *logical fallacy*.

' Λ CDM model' of the universe explains the formation of large scale structures from fundamental particles. This is a bottom-up phenomenon and involves a number of events. Here, there are only two logical possibilities: (i). either all the events involved are bottom-up and the phenomenon automatically becomes bottom-up, (ii). or the events are in different directions, but a 'top-down causal effect' makes the phenomenon bottom-up. The events proposed in Λ CDM model have different directions (all are not bottom-up), but still it is assumed that events automatically decide the direction. This also is a case of *logical fallacy*.

14. Conclusion:

Top-down causal effect (confining) ensures that entities cannot escape. In its absence, entities are free to move out and so cannot act as a system. So any system will have a dominant top-down causal power. The top-down causal power present in the universe is gravity. The confining nature of gravity gives stability to the structure of the universe

and the structure controls everything inside it. However, present-day physics ignores this fact completely. Top-down causality is thus the missing link in our theories, and recognizing its existence is the most urgent need at present.

' Λ CDM model' and the 'Standard Model', as pointed out, are based on logically incorrect assumptions. Top-down causality should be incorporated in these models to make them logically correct. However, introducing top-down causal effects makes the model-dependent structures in these, like dark matter, fields-alone, singularity, etc. totally unnecessary, and this makes these models irrelevant. The hierarchical-model, in which top-down causality has a crucial role, is capable of explaining^[4] the events at both the particle level and cosmic level. That is, recognizing the top-down causal effect of the universe will lead us to the Theory of Everything.

Reference:

- [1]. Jose P Koshy, *The Inherent Relation Between Motion and Force (Motion Creates the Forces of Nature)*, <http://vixra.org/abs/1312.0176>
- [2]. Jose P Koshy, *Unification of Forces: a Complete Model with Theoretical Proof*, <http://vixra.org/abs/1402.0103>
- [3]. A paper explaining the pulsating model of the universe will be posted in **vixra** soon
- [4]. Jose P Koshy, *From Microcosm to Macrocosm: the Structure of the Physical World at a Glance*, <http://vixra.org/abs/1401.0178>