Extended Abstract of:

"Is Physics Legislated by Cosmogony?" (J. A. Wheeler)
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In this contribution we propose a formalization in the framework of Category Theory of the ontology of the causal generation of the mathematical laws of physics using Kripke models on a coalgebraic basis. In a visionary paper published almost forty years ago J.A. Wheeler posed the provocative question: "is physics legislated by cosmogony?" in front of the "quantum information revolution", related to the theory of "quantum computing" in fundamental physics and cosmology, a theory originally developed by the Nobel Laureate R. Feynman – the most famous of Wheeler students. The positive answer to such a question implies a deep revision of the ontology underlying the Newtonian physics of which best formal version is certainly R. Carnap's Logical Atomism (LA). The present work has thus a double, related issue. On one side, we present a first formal treatment of the Natural Realism (NR), as the proper formal ontology of the actual evolutionary cosmology. I.e., an ontology of the causal foundation of the same mathematical laws of physics, given that they evolve with the universe they rule. An issue for which some theoretical physicists and mathematicians tried to develop, at the foundation level, the theory of "arboreal causal sets". NR is thus systematically, formally different, despite several phenomenological contact points, from the analogue proposal of a naturalistic alternative to LA: the Conceptual Natural Realism (CNR), recently proposed by my colleague and friend, N. B. Cocchiarella. Ontology, is based, indeed, on the logic of the converse implication ($q \leftarrow p$) and of its modal version ($\neg\Diamond(q \wedge \neg p)$), as the logic of the formal causality, according to an Aristotle's and Aquinas' suggestion. In it, the truth in the inferential chain is not conserved, and hence it is the proper logic of the unpredictable emergence of coherent behaviors in which the individuality of the elements composing the system at the beginning of the process disappears, so to justify the emergence of collective behaviors, and hence of ever more complex structures. We demonstrate thus that the proper Modal Logic (ML) of NR is KD45, or Secondary S5, and its Quantified ML (QML) is a possibilist first-order version (because of the axiom D) of the "objectual" Q1R System. In such a way, it is possible to formalize in NR an "arboreal" unraveling procedure of causal constitution (ancestor-descendants) – effectively a non-actualist version of R. Hayaki's "stipulation principle" – of nested domains/sub-domains of possible worlds, implementing a principle of "iterated modality" and of "stratified rigidity". In it, each level of the "unraveling" of equivalent domains has a KD45 structure, and the whole system has a nested KD45 structure, of growing complexity. NR seems thus an optimal candidate as formal ontology of an evolutionary cosmology based on the Quantum Field Theory (QFT), as irreducible to Quantum Mechanics (QM) because in the former, differently from the latter, the Stone-Von Neumann Theorem of the finitely many unitarily equivalent commutation relations between quantum variables does not hold.