

# Understanding Life in the Light of the Physics of the Immaterial

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It has been clearly and sufficiently established that life is founded in information processes. This does not avoid but includes the classical recognition about the fact that life cannot be reduced just to physical, chemical and energetic stances in the classical sense of the word. This paper claims that the understanding of life opens up the door for a physics of the immaterial very much according to information theory. Ultimately the field that arises in the horizon is biosemiotics, namely the study of how life, i.e. the living beings create, read, process, and interpret signs – and not just symbols, a phenomenon that goes far beyond the human history, far beyond biology in the traditional sense of the word and comprises also de universe. Several consequences are to be henceforth highlighted.

Along the paper, several hints are mentioned as a sort of a state-of-the-art. Five arguments are provided, thus: firstly, even though life is indeed a physical phenomenon, we do not as yet entirely know what matter is. Information theory in general allows for an understanding of life in terms of processes rather than components. We can and must turn our view from “states” to “processes” shedding thus important lights on to the interplay between physics and biology.

The second argument discusses how and why the first law of thermodynamics can rightly be understood in the framework of information. Accordingly, information is never created nor destroyed but is incessantly changing. Understanding such a principle brings us in front of the gates of information thermodynamics. This paper is aware about the fact that quantum thermodynamics, stochastic thermodynamics and thermodynamics of small systems are just being developed. In the limit it is necessary to generalize stochastic thermodynamics with quantum field theory. Being as it might be, information dynamics can be viewed as a sort of leading thread among this fields, processes and stances. The second argument just shows at the problem without entering into it, due to limits of space.

On this basis, the argument is taken up from Ch. Langton about the importance of studying both life as-we-know-it, and life as-it-could-be-possible. Both considerations are to be taken simultaneously and in parallel, not as complementary. Much more than a methodological, it is both a heuristic and a logical approach, it is claimed. In other words, understanding life entails both explaining why and how it is real in its variety and diversification as well as how it could be possible. This, it shall be argued, is the distinctive trait of a complex approach about living beings.

Subsequently, a fourth argument is set forth, namely that understanding the logics of life allows for solving the hurdle about the origins of life. To be sure, a logics of life has been provided. It can be called as biological hypercomputation. Living beings are not a machine in any sense of the word (not even a quantum machine or quantum information processors). In other words, we are to understand life not by what it is but by what living beings do. Living beings metabolize, process information, and are capable of homeostasis. These are three different ways for assessing that life and information are closely intertwined – if not one and the same thing.

A sound argument then is that life emerges complex and creates the conditions for its own emergence and sustainability. The argument that first some conditions are to be created prior to the appearance of life is judged as flawed and ad hoc in the framework of complexity science. Thus, self-organization, autopoiesis and an organismic grasp of life can be taken as equivalent. This argument is tied to the idea that information is not created

nor destroyed, but unceasingly changing. In other words, there is never a beginning or an end, but a continuous process of metamorphosis. The classical ideas about “beginning” and “end” are sheer simplifications adopted for the sake of claims such as “for all practical purposes” (FAPP), i.e., in a pragmatic even though methodological and naïve take of things.

The five arguments are closely intertwined and the reasons for their weave are explained and justified along the paper. The picture that emerges is one that allows claiming that life sets up a mindset about a physics of the immaterial. A first-hand approach for such a physics can be viewed as biosemiotics. The reasoning goes along the classical argument *it from bit from qubit*, but it also introduces a radical shift in that acausal explanations are not different from autopoietic or self-organized processes and stances. At the end the idea of a physics of the immaterial is explained and justified based on the arguments provided. Information theory radically modifies the ontology of the world and the universe, so to speak, and that it deepens and enlarges the classical view about both the real and the possible.

#### References (selected)

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