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Physics of Life Reviews 24 (2018) 45–46

PHYSICS of LIFE reviews

www.elsevier.com/locate/plrev

Comment

Lifting the Markov blankets of socio-cultural evolution A comment on "Answering Schrödinger's question: A free-energy formulation" by Maxwell James Désormeau Ramstead et al.

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Received 1 November 2017; accepted 2 November 2017
Available online 3 November 2017
Communicated by J. Fontanari

Ramstead et al. [8] claim an encompassing ontology which can be used as a heuristics for studying life, mind, and society both empirically and in terms of computer simulations. The systems levels are self-organizing into a hierarchy; "Markov blankets" close the various levels for one another. *Homo sapiens sapiens* is placed at the top of this hierarchy as "the world's most complex living systems." Humans are said to generate "(epi)genetically-specified expectations that have been shaped by selection to guide action-perception cycles toward adaptive or unsurprising states."

Is the level of expectations only "epi-genetic" or can it be considered as a next systems level with a dynamics of its own? Since each level is generative of the next one, one can also ask: "what is generated" by entertaining expectations? The sciences, for example, can be considered as systems of rationalized expectations; but these expectations are intersubjective. How are they generated as coordination mechanisms at an intersubjective level?

Let us recall the sociological literature concerning instances where a second contingency of expectations is constructed among human beings on top of the biological one of "living together." This second contingency is generated from the double contingency inherent in the relation between *Ego* and *Alter*: *Ego* expects *Alter* to entertain expectations about *Ego* just like her own about *Alter*. The second contingency evolves as interacting expectations. A reflexive dynamics of meaning and intentionality is thus added to the contingency of observable actions. This non-biological layer can be considered as a category *sui generis* [3].

Parsons [7] noted that the social system of expectations is instantiated as *super-ego* in each individual; it disciplines us instead of being adapted by us in "action-perception cycles." Luhmann [6] hypothesized that this social system of expectations is *autopoietic*, yet non-living. He added that the non-linear interactions among expectations in communications can generate codes of communication that are functionally differentiated. For example, the same issues are constructed differently in political or scholarly discourses; the respective codes frame the communications. Unlike DNA, these non-biological—symbolic—codes are not hard-wired. A cultural evolution is thus shaped on top of the biological one. Expectations can evolve faster than living systems.

A system that is constructed in terms of expectations can be considered as strongly anticipatory [2]: it generates its own future states, and not only predictions about future states. Whereas human minds are able to specify expectations, technological intervention on the basis of predictions is constructed in terms of expectations codified at the

DOI of original article: https://doi.org/10.1016/j.plrev.2017.09.001.
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https://doi.org/10.1016/j.plrev.2017.11.005

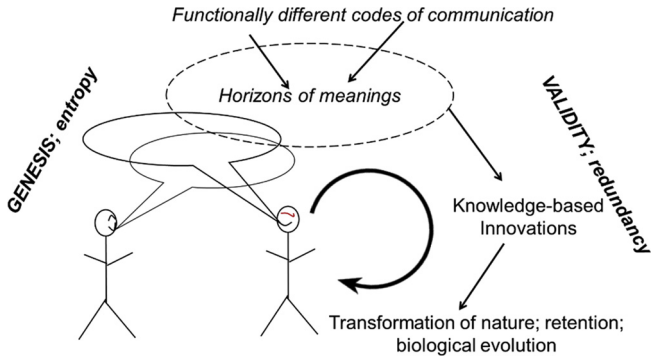

Fig. 1. The transformation of nature by cultural expectations. (Adapted from: Leydesdorff [4].)

supra-individual level. This communication of expectations is coupled to the biological layer by mental consciousness at the individual level and by institutions or social constructions as phenotypical retention mechanisms.

The interactions among the codes (e.g., political, scientific, economic) can generate redundancies by providing different meanings to the same events (e.g., [9], pp. 59f.). Redundancy can also be considered as not-yet realized options. Cultural evolution thus infuses the systems dynamics by extending the maximum entropy [1]. The additional options enable us to lift the Markov blankets in terms of knowledge-based reconstructions and interventions. Knowledge-based technologies feedback on our social world using an arrow (downward in Fig. 1) that is different from the generation of scientific knowledge through exchanging expectations (upward).

The codes in scholarly communications stabilize rationalized expectations to such an extent that other subsystems (e.g., the economy) can be increasingly built upon this fundament and become knowledge-based. The incursion of expected states on the current ones reverses the entropy flow. Using the additional options the systems under study can be reconstructed; previous states can thus be overwritten from the perspective of future ones simulated in models. The overwriting of the system on the basis of a model replaces "nature" as a previous state with cultural reconstructions.

From this perspective, the rewrite of evolutionary systems theory by Ramstead et al. changes the ontology, including the definition of "nature." This rewrite, however, is knowledge-based and therefore has the status of a hypothesis. The resulting knowledge claims (in the context of discovery) are selected using symbolic codes of communication (in the context of validation). In summary: on top of the hierarchically generated bio-system a complex—horizontally and vertically differentiated [5]—knowledge base has been generated that enables us to deconstruct and reconstruct previous states in a cultural evolution.

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