

**Title: Markov blankets and the preformationist assumption**

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**Abstract**

Bruineberg and colleagues argue that a realist interpretation of Markov blankets inadvertently relies upon unfounded assumptions. However, insofar as their diagnosis is accurate, their prescribed instrumentalism may ultimately prove insufficient as a complete remedy. Drawing upon a process-based perspective on living systems, we suggest a potential way to avoid some of the assumptions behind problems described by Bruineberg and colleagues.

## Commentary

Bruineberg and colleagues contend that so-called ‘Friston blankets’ introduce a number of “non-arbitrary assumptions” in applying Markov blankets to the boundaries of living systems (Bruineberg et al. 2021, para. 4.1, 4.2). The application of Markov blankets to living systems requires prior observations providing “a principled justification for why to start from one particular model rather than a different one” (Bruineberg et al. 2021, para. 6.1). In this sense, they conclude, Markov blankets owe part of their explanatory power to these prior assumptions to a point where “it is not clear that the Markov blanket formalism is doing much additional work” (Bruineberg et al. 2021, para. 6.1).

If the application of Markov blankets to living systems is indeed determined by such underlying assumptions, this would seem to imply that at least some of the confusions which Bruineberg and colleagues have set out to untangle run deeper than our attitudes towards Markov blankets.

If so, then a strong instrumentalism about Markov blankets may itself be insufficient as a measure to untangle the root causes of the confusions between realist and instrumentalist readings of Markov blankets (see Andrews 2020 and Kirchhoff, Kilverstein and Robertson 2022 for recent discussion of realism and instrumentalism *qua* FEP models). Besides the eternal vigilance demanded by our models and metaphors, we may need to reevaluate some of the starting observations informing their application.

The assumption that the organism and the environment constitute two conditionally independent interactants defines many Bayesian approaches to living systems, including the Fristonian one targeted by Bruineberg and colleagues. This guiding assumption behind designating living systems in terms of an inner organism contraposed by an outer environment may be interpreted as a variant of preformationism: the notion that organisms and environments constitute and should be evaluated in our theorizing as separate entities with inherent properties, and whose interaction is essentially secondary to their independent existence (see Anderson 2017).

This assumption, of a pre-established conditional independence between organisms and their respective environments, presents a potential point of theoretical (Colombo & Wright 2021) and empirical (Aguilera et al. 2021) incongruity between Markov blankets and the essentially coupled character of sensorimotor interfaces. It has moreover been brought into question by more recent accounts emphasizing the constitutive role which interaction plays in producing and sustaining the separate forms of organism and environment (see for example Bruineberg & Rietveld 2019; Gallagher & Allen 2016; Kirchhoff & Kiverstein 2019, 2021).

We believe that the risk of preformationism echoes earlier debates within the literature in that it “force[s] us to recognize that the picture of biological agents as free-energy-minimizing systems requires something closer to a process-based (rather than a static or state-based) ontology” (Clark 2017, p. 17). In this regard, existing accounts have already shown how temporally deep hierarchical models provide for adaptive models with less sharp distinctions between organisms and their environments (see Kirchhoff et al. 2018).

What we here want to briefly suggest is that a process-based perspective may furthermore avoid preformationism not only in the application of Markov blankets, but also at the level of the underlying assumptions which informs this application.

The sort of process-based perspective that we have in mind serves to preclude preformationism specifically by reconceptualizing stabilized forms on either side of the (Markov) boundary as products of ongoing exchanges that serves to perpetuate the living system. That is, under a process-based perspective on living systems, we may understand the organism and its respective environment not as a pre-formed substance but as an ensemble of processes (e.g., metabolism). The process view we refer to echoes the view of process ontology which takes processes -- instead of substantive forms -- as the fundamental unit of analysis in biology. Process ontology seeks to reverse the explanatory relation between entities and processes: rather than explaining processes in terms of interactions between distinct entities, process ontology explains entities as relatively stable phases of continuous processes (Nicholson & Dupre 2019; see also Griffiths and Stoltz 2019).

Narratively, as applied to active inference, a process based perspective conceptualizes organismic boundaries as ‘hard-won achievements’ of living systems (Kirchhoff & Kiverstein 2019; see also Kirchhoff 2015 and Sutton 2011). This reversal is decisive for at least one of the underlying assumptions that Bruineberg and colleagues ascribe to Friston blankets: it eliminates the need for the assumption of a preformed organism *qua* model and environment *qua* modeled distal world, which arguably commits Friston blankets (and other Bayesian accounts) to a particular variant of substantialist realism. In its stead, processes are what is taken to be the fundamental unit of biological analysis. Under a process-based view, then, one need not assume the organism and environment since these may be derived from the continuous exchanges.

While Bruineberg and colleagues’ prescribed strong instrumentalism might still furnish us with helpful resources for clearing up confusions surrounding the application of Markov blankets to living systems, we find that some such confusions may still be traced to the prior observations that inform this application. We believe that a process-based perspective may aid us in upending a central assumption which prefigures some of the forms of confusion targeted by Bruineberg and colleagues. While a far cry from absolving us of the duty to attend to other crucially important issues pointed out by Bruineberg and colleagues in their insightful target article, we nonetheless believe that critically assessing the starting assumptions underlying these issues may ultimately prove to be indispensable in their resolution.

**Conflict of interest** (Dengsø, Robertson, Constant): none

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