

Comment

Cultural Markov blankets? Mind the other minds gap!

Comment on “Answering Schrödinger’s question: A free-energy formulation” by Maxwell James Désormeau Ramstead et al.

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Ramstead et al. have pulled an impressive feat. By combining recent developments in evolutionary systems theory (EST), machine learning, and theoretical biology, they seek to apply the free-energy principle (FEP) to tackle one of the most intractable questions in the physics of life: why and how do living systems resist the second law of thermodynamics and maintain themselves in a state of bounded organization? The authors expand on a formal model of neuronal self-organization to articulate a meta-theory of perception, action, and biobehaviour that they extend from the human brain and mind to body and society. They call this model “variational neuroethology” [1]. The basic idea is simple and elegant: living systems self-organize optimally by resisting internal entropy; that is, by minimizing free-energy. The model draws on, and significantly expands on Bayesian predictive-processing (PP) theories of cognition, according to which the brain generates statistical predictions of the environment based on prior learning, and guides behaviour by working optimally to minimise prediction errors. In the neuroethology account, free energy is understood as “a function of probabilistic beliefs” encoded in an organism’s internal states *about* external states of the world. The model thus rejoins ‘enactivist’ and ‘affordances’ accounts in phenomenology and ecological psychology, in which ‘reality’ for a living organism is understood as perspective-dependent, and constructed from an agent’s prior dispositions (“probabilistic beliefs” in Bayesian terms). In ecological terms, an organism operates in a niche within what its dispositions in relation to features of the environment ‘afford’. Ramstead et al. borrow the concept of Markov Blanket from mathematics to describe the processing of internal states and beliefs through which an organism perceives its environment. In machine learning, a Markov Blanket is a learning algorithm consisting of a network of nested ‘parent’ and ‘children’ nodes for hierarchical information processing. Ramstead et al. take up this model to describe the perceptive ‘veil’ through which human sensory states are coupled to affordances of the broader environment. Building on the recently formulated cultural affordances paradigm, the authors extend their model to a meta-theory of the human niche, in which “cultural ensembles minimise free energy by enculturating their members so that they share common sets of precision-weighting priors”. Ramstead et al. propose to enrich the cultural affordances account by bringing in the hierarchical mechanistic mind (HMM) model, which assumes the free-energy principle as a general mechanism underpinning cognitive function on evolutionary, developmental, and real-time scales. They concede, however, that ways of further integrating the HMM with cultural affordances remain an open question. As a cognitive anthropologist

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and co-author of the first Cultural Affordances article [2], I am happy to provide the outline of an answer. For humans, affordances are mediated through recursive loops between natural features of the environment and human conventions. A chair, for example, affords sitting for bipedal agents. This is ‘natural’ enough. But for humans, chairs afford sitting and not-sitting in myriad context and status-specific ways. A throne affords not-sitting for all but the monarch. In the absence of the monarch, it may afford transgressive sitting for the most daring. How do these conventional affordances come to hold with such precision? In the original model, we defined culture as collectively patterned and mutually reinforced behaviour mediated by largely implicit expectations about what one expects others to also expect – and to expect of one by extension. Environmental cues may act as triggers of affordances, but joint meta-expectations do all the mediating work. Meaning and affordances in the environment of the *Homo Sapiens* niche, are mostly (if not exclusively) picked up through the ‘veil’ of what one expects others to expect. The Markov Blanket in the human niche (the cultural Markov Blanket), thus, serves as a buffer to exploit statistical regularities in *human psychology* at least as much, if not more than in external states of the world. Human internal states about external states, in other words, are mediated by expectations about other humans’ internal states. The nestedness of these inferences should be primarily conceptualized at the level of *recursive mindreading* – or inferences about other humans’ internal states (about both internal and external states), dispositions, anticipations, and propositional attitudes. In order to function optimally and minimise cognitive energy in any given context, I have to know that you [the context-relevant other, actual or generalized] know that I know that you know that I know, etc. how to behave in that context. Navigating social life and cultural affordances requires the smooth acquisition, processing, and constant updating of infinitely recursive inferences about many specific, generalized, and hypothetical *other minds*. It might be useful to specify, thus, that the cultural Markov Blanket is one that mediates world-agent perception and action through the veil of Other Minds.

Hypothesizing about phylogenetic time, Ramstead et al. mention the proverbial crossing of the evolutionary ‘Rubicon’ (usually located between 200 and 100 thousand years ago as humans transitioned from anatomical to behavioural modernity [3]), after which human evolution became ‘ratcheted’ [4] to a process of outsourcing knowledge, skills, and a guide for behaviour to a large, cumulative, and iterative repertoire of cultural information and ecological modifications. Readers might be interested in recent accounts in evolutionary science that seek to move beyond just-so stories about the appearance of ‘missing cognitive ingredients’ in the so called environment of evolutionary adaptedness (EEA). Biological anthropologist Sarah Hrdy [5,6], for example, has offered a compelling account of the evolution of what she terms ‘emotional modernity’ over two million years ago in the *Homo Erectus* lineage. For Hrdy, the large brains and long, vulnerable childhoods of early hominin co-evolved with the post-reproductive longevity of menopausal females, and the emerging practice of *collective parenting*. On her cooperative breeding account, the optimal mindreading and perspective-taking abilities that hold the human niche together evolved as good caregivers and those good at eliciting care were naturally and culturally selected. Hrdy’s account, like Ramstead et al.’s, collapses temporal scales to point out the importance of ontogeny (or development) in providing and building on dispositions acquired in phylogeny (or evolutionary time). The EEA, thus, is always, already present in developmental and real-time scales.

On this view, variational neuroethology joins a growing interdisciplinary body of theory known as the Extended Evolutionary Synthesis (EES) [7], in which old models that stressed evolved adeptness are being rethought as ongoing, ontogenetic adaptability and plasticity.

The authors should also be commended for speculating on the applicability of their model to the study of social systems. Conventional wisdom often depicts social evolution as one of increasing complexity. A closer reading of ways in which humans have solved coordination problems in large-scale sociality, however, may reveal that as a function of free-energy minimization, social systems tend to maintain, and even increase legibility and *simplicity* over time. The anthropologist David Graeber [8], for example, has pointed out in his history of money that the financial systems that are now standardized on a global scale were devised to produce increasingly *simple* (by some accounts *too simple*) patterns of social, political, and moral regulation to handle coordination problems. Writing on the evolution of ‘religious’ representations over time, cognitive anthropologist Pascal Boyer has argued that the intricate diversity of world religions has gone from “the very many to the many fewer” [9]. Social scientists, at least since Weber [10], have often lamented the human cost of bureaucratization and rationalization [11], but these dynamics have rarely been theorized as natural consequences of free-energy minimization. Rather than propose a weird metaphysics of autonomous, self-organizing ‘societies’, however, social and cognitive scientists should mind the cognitive gap, and remember that the ‘culprit’, if there is one, is none other than the simplicity-craving, free-energy-minimizing human mind. For the rest, we can also celebrate the many human traditions in spirituality, the humanities, and the Arts that

have emphasized the importance of doubt, uncertainty, novelty, and unknowability. In the end, it may very well be these propensities to *resist* free-energy minimization that make us humans.

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