

Behavioral and Brain Sciences

Volume 42

2019, e216

Prediction, embodiment, and representation

[István Aranyosi](#) ^(a1)

DOI: <https://doi.org/10.1017/S0140525X19001274>

Published online by Cambridge University Press: 28 November 2019

In response to: [Is coding a relevant metaphor for the brain?](#)

[Related commentaries](#) (27) [Author response](#)

Abstract

First, I argue that there is no agreement within non-classical cognitive science as to whether one should eliminate representations, hence, it is not clear that Brette's appeal to it is going to solve the problems with coding. Second, I argue that Brette's criticism of predictive coding as being intellectualistic is not justified, as predictive coding is compatible with embodied cognition.



Check for updates

Copyright

COPYRIGHT: © Cambridge University Press 2019

Hide All

Among the shortcomings that the metaphor of coding involves, Brette mentions its inability to truly function as a representation. At the same time, he seeks an alternative to coding in non-classical cognitive science, such as dynamic systems, ecological psychology, and embodied cognition, which, in their most radical and most interesting versions are precisely *anti*-representationalist approaches. How is the former complaint to be squared with the latter alleged solution? Brette does not tell us, but his critical discussion of predictive coding indicates that, ultimately, his problem with coding is the alleged intellectualism involved in it, hence, it is the alternative, embodied and embedded cognition theory that he thinks should be understood as currently the best remedy. He appears to think that an approach like predictive coding suffers from the same problems of intellectualism and inadequacy when it comes to how an organism perceives.

There are two problems with this view. One is that the embodied and embedded approach to the mind lacks anything close enough to agreement when it comes to whether representation should or should not play a central role (or any role) in it. The other is that, similarly, predictive coding does not (or should not) imply anything in particular about the issue of classicism versus 4E (embodied, embedded, enactive, extended) cognition. I will, in turn, explain these two simple points.

First, let us consider the issue of representation within the framework of non-classical cognitive science. It makes sense to structure the multitude of such views in some meaningful way. Following Gallagher ([2017](#)) we could order these views according as how committed they are to eliminating representations and how anti-individualistic they are, that is, to what extent the organism is considered as sufficient for cognition and mentality. The extant views range from ones that are very close to classicism in both taking representations as necessary to cognition and taking the organism as the ultimate unit of analysis to ones that pride themselves in being so radical as to eliminate representations completely and hypothesize that the ultimate unit of analysis is the causal loop between organism and its environment or niche. What, then, to make of the idea that a viable alternative to the metaphor of receptor coding could be 4E cognition, given this diversity of 4E views? It looks like the only versions that could serve that purpose are the most radical ones on the above-mentioned two-axis classification. Indeed, Brette explicitly states that one crucial problem with receptor coding is its inadequacy in emulating the organism-environment circular causal loop, at least when it comes to perception; more precisely, given that this loop (reafference) is an ultimate unit of analysis of cognition, it does not make sense to posit receptor coding as a first stage (afference) in perceptual processing.

This idea is coherent, but one wonders, then, why receptors would even get be discussed at all. If the reafference and the continuous circular causal loop of organism-environment interaction is truly the ultimate unit of analysis, then there is nothing special about the receptors to consider, or about any other part of the nervous system for that matter. Then it looks as though the initial problem was not really about *receptor* coding in particular, but about anything like computational processes that are at a lower level than the organism-environment loop. This is not an alternative to receptor *coding*, but an alternative to the receptors themselves – they would cease to have any theoretical role in explaining cognition or perception. Needless to say, one is not forced in any way to take that route even if one is skeptical about the metaphor of coding. On the contrary, one could even consider the PNS (including the receptors) as an *essential* component of the neural realizers of any perceptual or sensory state (Aranyosi [2013](#)) or go even as far as to hypothesize that neuron populations at the receptor level are performing *computations* (Pruszynski & Johansson [2014](#)).

Turning now to predictive coding in particular, contrary to Brette's criticism, it does not necessarily imply intellectualism. It is true that the most interesting and radical way of thinking about predictive coding is one according to which it is rather a "Kantian" *rival* to 4E cognition (e.g. the view defended in Hohwy [2013](#) and especially in Hohwy [2016](#)), but it is not the only game in town. Indeed, when it comes to perception, there is no reason to think that predictive coding is uncongenial to 4E cognition. On the contrary, as Orlandi ([2018](#), p. 2368) observes, "PCP [*predictive coding approach to perception*] was initially developed in cognitive science in the field of active vision, and it was thought to be good news for proponents of ecological and embodied understandings of perception (Rao and Ballard [1999](#)). It is a curious development that it would be taken up by proponents of more intellectualist accounts." The basic point to emphasize here is that the central tenets of predictive coding (generative models, prediction error minimization, free energy principle) are really about a model of information *communication*; the issue of whether that communication chain is present wholly within the brain, as Hohwy thinks, or spans across the brain-body or even across the body-environment frontier (c.f. Kirchhoff [2015](#)) is orthogonal to the issue of whether the model is adequate for perception or cognition in general. Hence, there is nothing intrinsically uncongenial to more embodied and embedded views of the mind in the idea of predictive coding.

To sum up, while I think Brette points out some significant shortcomings of the metaphor of receptor coding, it is unclear whether an alternative to it, in guise of what he seems to think this would involve, is forthcoming anytime soon.

References

- Aranyosi, I. (2013) *The peripheral mind: Philosophy of mind and the peripheral nervous system*. Oxford University Press. [CrossRef](#) | [Google Scholar](#)
- Gallagher, S. (2017) *Enactivist interventions: Rethinking the mind*. Oxford University Press. [CrossRef](#) | [Google Scholar](#)
- Hohwy, J. (2013) *The predictive mind*, Oxford University Press. [CrossRef](#) | [Google Scholar](#)
- Hohwy, J. (2016) The self-evidencing brain. *Noûs* 50(2):259–85. [CrossRef](#) | [Google Scholar](#)
- Kirchhoff, M. D. (2015) Experiential fantasies, prediction, and enactive minds. *Journal of Consciousness Studies* 22(3/4):68–92. [Google Scholar](#)
- Orlandi, N. (2018) Predictive perceptual systems. *Synthese* 195(6):2367–86. [CrossRef](#) | [Google Scholar](#)
- Pruszynski, J. A. & Johansson, R. S. (2014) Edge-orientation processing in first-order tactile neurons. *Nature Neuroscience* 17:1404–9. [CrossRef](#) | [Google Scholar](#) | [PubMed](#)
- Rao, R. P. & Ballard, D. H. (1999) Predictive coding in the visual cortex: A functional interpretation of some extra-classical receptive-field effects. *Nature Neuroscience* 2:79–87. [CrossRef](#) | [Google Scholar](#) | [PubMed](#)