

# Agents and Organisms : Why the difference is important for the representation discussion (and cognitive science in general)

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**Abstract.** From the very start of the embodied cognition movement in the early nineties, the discussion on the centrality of representations for explanations in cognitive science has been a major theoretical and conceptual issue. Most notably Brooks work in robotics and Van Gelders dynamical approach initiated a new critical attitude towards the use of representations in cognitive science. In response the critics were criticized in turn, resulting in a debate that is going on to this very day (e.g. [1, 4]).

In this talk, I will investigate a possible reason for the difficulty in coming to a consensus on the representation issue. The idea presented here is that this discussion itself reflects a tension in how we conceive the cognitive domain: I will differentiate between the notions of agents and organisms that are often used as roughly equivalent. Here, the claim will be developed that they can actually be cast as two different foundations for the cognitive domain. Agents are drawn as entities that receive information and act in some environment. Organisms are drawn as biological systems that maintain themselves over time through various metabolic processes, while being structurally coupled to their environments. Obviously, organisms can also be conceived of as agents, ranging from very simple to increasingly complex. In contrast, agents need not be organisms, as for example artificial, institutional and supernatural agents are not.

The notion of cognition can be linked to both agents and to organisms, although usually the difference is not stressed as both seem to coincide when it comes to cognition. However, differentiating between an explicitly agent-based and an organism-based interpretation of cognition has many interesting implications. When centered on agents, cognition becomes closely linked to entities that perceive and act on their environments. The specific realizer or entity involved is not heavily constrained here, as long as an interpretation in terms of perception and action is appropriate. There is no need to restrict this interpretation to living systems as it applies much wider, while at the same time organisms can be interpreted as agents too.

Within the cognitive domain, organisms—certainly in the form of humans—are most often interpreted as the most important case of cognitive systems. However, it is less common to stress that the biological nature of organisms is essential for cognition. Of course there are important exceptions, such as Maturana and Varela's (1980) work on autopoiesis, the original enactivism of Varela and Thompson [12, 10], Sheets-Johnstones [9] notion of animation and Lyons [7, 8] biogenic approach. Nevertheless, even when it occurs, this biological connection is regularly resisted, in favor of, e.g., extended functionalism [2] or radical enactivism [4]. The main problem discerned for a deep connection between life and mind is that this link does not

seem to be intrinsic, but rather an additional constraint on mind that is not essential. The rhetorical question here is: why would a suitably programmed artificial agent a robot not constitute a cognitive system?

The proper answer to this question and its implication should be obvious: artificial agents are not self-evidently part of the empirical domain constituted by organisms humans included that provide the natural examples of cognitive systems. As an analogy, it would be outrageous to argue that the cell theory for organisms should not have been accepted in the Nineteenth Century because it did not fit in with a variety of life-like artifacts, such as Vaucansons digesting duck, which dont have any cells. The point here is that we should not think of the cognitive domain as something that is somehow generic and better exemplified by non-natural instances like angels rather than natural ones like insects; cognitive phenomena occur naturally as an empirical fact in the comparatively restricted domain that consists of organisms. There is no need to connect cognitive phenomena to organisms because the latter are the empirical cases where cognitive phenomena can be witnessed in the first place. Whether artificial agents should be considered cognitive or not is as interesting and relevant a pastime as deciding whether artificial organisms are alive or not. A more fruitful study of cognition should involve a biogenic approach, building on characteristics and empirical findings in a wide variety of organisms as stressed by Lyon.

One major difficulty in accepting this line of thinking is the lack of a clear differentiation between agents and organisms. The notion of agents clearly applies to organisms and in particular seems to catch what might be relevant there when it comes to cognition. The seems is here a key word as actually we do not really know how organisms truly function when it comes to their dealings with their environment. Therefore, a better way to proceed is here to actually focus on organisms rather taking them as instances of agents.

In this talk, I will discuss how ongoing discussions on bacterial [11] and plant cognition [3] help to clarify the particular role played by organisms, irrespective of any interpretation as agents. In addition, I will discuss recent work on early nervous systems that challenges the interpretation of nervous systems as agent-like input-output devices [6, 5]. I will use these cases to develop the outlines of an organism-based interpretation of cognition that diverges from the more intuitive agent-based one. The result is an approach to cognition where the discussion on representations is not a main issue but a side-show to understanding how organisms deal with their environments.

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## REFERENCES

- [1] Anthony Chemero, *Radical embodied cognitive science*, MIT press, 2009.
- [2] Andy Clark, *Supersizing the mind: Embodiment, action, and cognitive extension: Embodiment, action, and cognitive extension*, Oxford University Press, 2008.
- [3] Paco Calvo Garzón and Fred Keijzer, 'Plants: Adaptive behavior, root-brains, and minimal cognition', *Adaptive Behavior*, **19**(3), 155–171, (2011).
- [4] Daniel D Hutto and Erik Myin, *Radicalizing enactivism: Basic minds without content*, MIT Press, 2013.
- [5] Fred Keijzer, 'Moving and sensing without input and output: early nervous systems and the origins of the animal sensorimotor organization', *Biology & Philosophy*, 1–21, (2015).
- [6] Fred Keijzer, Marc Van Duijn, and Pamela Lyon, 'What nervous systems do: early evolution, input-output, and the skin brain thesis', *Adaptive Behavior*, 1059712312465330, (2013).
- [7] Pamela Lyon, 'The biogenic approach to cognition', *Cognitive Processing*, **7**(1), 11–29, (2006).
- [8] Pamela Lyon and Fred Keijzer, 'The human stain. why cognitivism can't tell us what what cognition is & what it does', *The Mind, the Body and the World: Psychology After Cognitivism?*, 132, (2007).
- [9] Maxine Sheets-Johnstone, 'Animation: the fundamental, essential, and properly descriptive concept', *Continental Philosophy Review*, **42**(3), 375–400, (2009).
- [10] Evan Thompson, *Mind in life: Biology, phenomenology, and the sciences of mind*, Harvard University Press, 2007.
- [11] Marc Van Duijn, Fred Keijzer, and Daan Franken, 'Principles of minimal cognition: Casting cognition as sensorimotor coordination', *Adaptive Behavior*, **14**(2), 157–170, (2006).
- [12] Francisco J Varela, Evan Thompson, and Eleanor Rosch, *The embodied mind: Cognitive science and human experience*, MIT press, 1991.