



# Mechanistic explanation, cognitive systems demarcation, and extended cognition

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## ABSTRACT

Approaches to the Internalism–Externalism controversy in the philosophy of mind often involve both (broadly) metaphysical and explanatory considerations. Whereas originally most emphasis seems to have been placed on metaphysical concerns, recently the explanation angle is getting more attention. Explanatory considerations promise to offer more neutral grounds for cognitive systems demarcation than (broadly) metaphysical ones. However, it has been argued that explanation-based approaches are incapable of determining the plausibility of internalist-based conceptions of cognition vis-à-vis externalist ones. On this perspective, improved metaphysics is the route along which to solve the Internalist–Externalist stalemate. In this paper we challenge this claim. Although we agree that explanation-orientated approaches have indeed so far failed to deliver solid means for cognitive system demarcation, we elaborate a more promising explanation-oriented framework to address this issue. We argue that the mutual manipulability account of constitutive relevance in mechanisms, extended with the criterion of ‘fat-handedness’, is capable of plausibly addressing the cognitive systems demarcation problem, and thus able to decide on the explanatory traction of Internalist vs. Externalist conceptions, on a case-by-case basis. Our analysis also highlights why some other recent mechanistic takes on the problem of cognitive systems demarcation have been unsuccessful. We illustrate our claims with a case on gestures and learning.

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## 1. Introduction

With the rise of the mechanistic model of explanation in the last two decades, system-mechanism demarcation has become a key aspect of explanation in the cognitive and life sciences (Craver, 2007; Haugeland, 1998; Kaplan, 2012). When capacities like digestion, respiration, pattern recognition, or item retention are explained in terms of their underlying mechanisms, it’s crucial to know what parts belong to those mechanisms, and how they contribute to their functioning, and which ones do not. Mechanism demarcation is key to (constitutive) mechanistic explanations

(Craver, 2007). That is, when are parts *genuine components* of systems-mechanisms, rather than mere causal background conditions or irrelevant parts?<sup>1</sup>

System-mechanism demarcation also occupies a center stage position in the *Internalism–Externalism* debate in the philosophy of psychology. Whereas Internalists argue that cognitive systems are comprised solely of neural components, externalists take it that, at least in some cases, non-neural features like environmental and/or bodily ones are genuine components of cognitive systems (Clark and Chalmers, 1998; Rowlands, 2010). Until recently, this issue has been predominantly addressed from a metaphysical angle:

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<sup>1</sup> We take mechanisms to be complex systems composed of component parts and processes that in organized fashion produce a specific phenomenon or phenomena. This is the consensus view in the mechanism literature.

although explanatory practices have been stressed as relevant to sorting out the issue, most traditional analyses give a priori intuitions center stage position in tackling the problem (cf. Adams and Aizawa, 2001; Sprevak, 2010). Explanatory practices are acknowledged as important, yet explicit analysis of what makes for the explanatory power of scientists' explanations and for the explanatorily relevant features in these explanations are few and far in between. Our first aim in this paper is to show that the demarcation issue in the *Internalism–Externalism* debate would benefit from re-shifting the focus from a priori intuitions to careful examination of explanatory practices and to build accounts of cognitive systems demarcation up from there. After all:

“The very point of an externalism in the spirit of Clark and Chalmers is to allow cognitive scientists to draw the line between cognitive and non-cognitive processes along differences that actually matter for their research instead of forcing them to accept criteria such as “inside the head versus outside the head” that seem arbitrary for a research perspective” (Ludwig, 2015, p. 364).

The shift from metaphysical a priori intuitions to explanatory considerations we are advocating is already underway in the recent literature (e.g., Keijzer and Schouten, 2007; Hurley, 2010; Sprevak, 2010; Kaplan, 2012; Poyhonen, 2013; Kirchhoff, 2014). This should come as no surprise. Metaphysical a priori intuitions so far have failed to deliver generally agreed criteria for cognitive systems demarcation; proposed ‘marks of the cognitive’ are tainted with internalist or externalist preconceptions, and demarcation yardsticks to which the different parties in the debate can agree on do not seem to be on offer (cf. Kaplan, 2012; Sprevak, 2010). Explanatory considerations are advertised to offer more neutral grounds for doing so (cf. Kaplan, 2012). We feel that this is the right way to go, but argue that a lot of work still needs to be done. We here attempt to advance the project further.

The recent focus on mechanistic explanation in the cognitive sciences, both in the philosophy of science and the philosophy of mind and cognition, can be seen as a response to the above plea to dissect cognitive mechanisms in ways that actually matter for explanatory purposes, i.e., attempting to make precise when items are constituents of cognitive systems-mechanisms and when they are not (cf. Kaplan, 2012; Kirchhoff, 2014; Poyhonen, 2013).<sup>2</sup> However, despite progress on the issue, cognitive system demarcation is still an unsolved issue. Hence our second aim in this paper is to explore where some extant mechanism-inspired approaches went off the track and how they should be extended to address the problem satisfactorily.

In order to do so we however need to address a potentially serious hurdle. Sprevak (2010) recently argued that explanation-oriented analyses are betting on the wrong horse: there is no inference to the best explanation (IBE) forthcoming that can decide on the most plausible hypothesis concerning the nature of cognitive systems. The hypothesis of *extended cognition* (HEC) meets an equally plausible explanatory rival in the hypothesis of *embedded*

cognition (HEMC).<sup>3</sup> Where HEC sees—in some cases—bodily and/or environmentally features as constitutive components of cognitive systems (Clark, 2008; Clark and Chalmers, 1998), HEMC views these features as (equally) explanatorily relevant, yet not part of cognitive systems, since the latter are taken to be comprised of internal components only (Rupert, 2004). Since both perspectives can handle the same explanation-seeking contexts equally well, Sprevak (2010, p. 359) concluded that “an IBE based on scientific practice is the wrong tool to decide between HEC and HEMC”. If he is correct, the recent (as well as ‘traditional’) appeals to explanatory practices and explanatory considerations would be a wrong turn. This conclusion, as we will argue, is premature however.

Thus, our third and main aim in this paper is to challenge Sprevak (2010) analysis. Although we agree with Sprevak that the (a priori) criteria invoked by friends and critics of HEC and HEMC alike fail to settle the issue, we argue that a reconstruction of explanatory practices in terms of the mutual manipulability account of constitutive relevance in mechanisms (Craver, 2007; Kaplan, 2012), extended with the “fat handedness” criterion (Baumgartner & Gebharter, 2015; Woodward, 2003, 2008), offers means to mount plausible IBEs with respect to HEC vs. HEMC, on a case-by-case basis.

According to the mutual manipulability account, in a nutshell, evidence is procured that a part is a component in a mechanism when interventions on the part result in changes in the overall behavior of the mechanism and, vice versa, interventions on a mechanism's overall behavior result in changes in the behavior of the part. Mutual manipulability implies that such interventions are common cause interventions that both change a mechanism's overall behavior and some putative constituent. Fat handedness dictates that for constitution to truly obtain, only such common case interventions should exist, ruling out interventions that solely change overall mechanism behavior without effecting changes in the behavior of putative parts (cf. Baumgartner & Gebharter, 2015; Woodward, 2003, 2008).

A key advantage of mutual manipulability is that it does not entail specific a priori assumptions about the nature of cognitive systems, leaving it an open empirical question whether cognitive systems are to be understood as solely brain-based or not.<sup>4</sup> Below, we present a case on gestures and learning (Alibali and Goldin-Meadow, 1993; Church and Goldin-Meadow, 1986; Goldin-Meadow and Beilock, 2010; Goldin-Meadow et al., 1993; Ping and Goldin-Meadow, 2010) in support of our analysis.

Our analysis also suggests why extant mechanistic approaches to the *Internalism–Externalism* issue, although promising in basic outlook, failed to handle the mechanism-demarcation issue satisfactorily. Several authors (e.g., Kaplan, 2012; Kirchhoff, 2014; Poyhonen, 2013) have used the framework of mechanistic explanation in order to solve the problem whether extra-cranial parts are

<sup>3</sup> Sprevak (2010) construes HEMC as an *internalist* account since cognitive systems on HEMC are internal ones, i.e., comprised solely of neural elements. HEMC differs with other internalist stances in that it considers environmental and/or bodily features to be highly explanatorily relevant. This construal is different from Rowlands' (2010) who construes HEMC in externalist fashion. The difference seems to be merely one of terminology, not content.

<sup>4</sup> Our application of mutual manipulability to IBE's concerning HEC and HEMC is inspired by Kaplan's (2012) application of the account to cognitive systems demarcation, and extends it in significant fashion in terms of Baumgartner and Gebharter's (2015) construal of the ‘fat handedness-criterion’. Without this extension, Kaplan's construal is vulnerable to criticism and counterexamples. We acknowledge that important conceptual groundwork has been done by Baumgartner and Gebharter (2015). We here test and apply their framework in the context of internalist vs. externalist construals of cognitive systems. This application has relevant implications for extant analyses of the nature of cognitive systems. See in particular Sections 4 and 5.

<sup>2</sup> The distinction we draw between metaphysical a priori intuitions and explanatory considerations is not to be confused with the distinction between epistemic and ontic (“metaphysical”) accounts of mechanistic explanation. According to the latter, explanatory factors are real, causal and constitutive factors in the world and not merely linguistic, explanatory items (Craver, 2007). However, identifying such factors heavily relies on explanatory considerations in Craver's system, viz. his mutual manipulability account of constitutive relevance is a tool to identify when entities' activities are constitutively relevant, i.e., genuine components, of mechanisms rather than causal background conditions or simply irrelevant parts. See Section 4.

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