

Body-Mind-World

Steps towards an extended mind

MÁTÉ HERCZEGH *

Abstract

Many assumptions of traditional cognitive science are based on the thinking of Descartes. The prevailing Cartesian model of cognition however seems to be insufficient in explaining some of the latest experimental results, therefore the revision of it becomes necessary. It seems from these experiments that cognitive processes are deeply determined by (non-neural) bodily processes and the processes of the external world, therefore a new concept of mind is required, where the mind is not a relatively closed system: more like a dynamic process that is always in interaction with its environment, and cannot be understood without it.

Key words: cognition, mind, world, extended mind, cognitive science, culture

OUTLINE OF THE PAPER

Descartes' legacy in traditional cognitive science

Motivations to reject the traditional cognitive model (experimental results):

Body in Mind (*embodied mind*)

World in Mind (*embedded mind*)

World as Mind (*extended mind*)

Extended mind and culture

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Introduction

At first I shall outline the Cartesian legacy in traditional cognitive science, its effect in creating the classical cognitive model. This legacy also formed and still affects the way we think about our minds in our everyday thinking.

Then I shall use some experiments to show that the „extramental” world (in its physical and cultural sense as well) plays a fundamental role in driving cognitive processes. The deep interactions between mind, body and world make it necessary to create a conceptual and theoretical framework that treats cognition not as an isolated, solipsistic entity, but a dynamic process which cannot be understood without its environment.

The Extended Mind by A. Clark and D. Chalmers (1998) contains a thought experiment, where a dispositional belief (that is usually considered a mental state) is realized in the physical world, namely in a notebook. The authors give us the criteria by which a part of the world can constitute a part of a cognitive process. These criteria can function as a good starting point to extend the original theory to cultural elements as well.

The three concepts of the title of this paper, and their relation to each other are very problematic, but it can be said that in general they are considered as discreet in a sense that they can be examined apart from each other. The aim of this paper is to show these concepts as forming a continuum, whose sharp (imaginary?) boundaries can (and should) be diminished.

* The author: *Herczegh Máté* (1989). PhD student, University of Szeged (SZTE), Málnási Bartók György Doctoral School of Philosophy. Philosopher with a Lykieon Researchers Diploma 2016.

Descartes' demon and traditional cognitive science

Descartes' theoretical search for the foundation of reliable and scientific knowledge (Descartes, 1642/2014) involves the use of methodological scepticism, of which the strongest sceptical argument is the hypothesis of the evil demon. The point of this hypothetical demon is that it might be deceiving us even in our most fundamental, most evident beliefs (such as our mathematical and logical truths), and so by extending doubt to every possible thing that can be doubted, we get to the *cogito's* „I think therefore I am”, a truth in which not even a malevolent demon could be deceiving us.

The Cartesian demon, however, means something different in the context of this paper: it covers some of the aspects of the Cartesian legacy still alive in the philosophy of mind. The demon is deceiving us in its new sense as well; not by falsifying our most evident truths and beliefs, but by creating and hiding our assumptions and presuppositions about our own minds. This effect should not be underrated, since it can be detected on the level of philosophical and scientific theorizing as well.

The four relevant aspects of the Cartesian legacy are the following¹: (1) the mind is a substance (2) the mind is “in the head” (3) mind and body are different substances (substance dualism) (4) solipsistic starting point. Let us articulate these.

(1) There are two serious consequences of understanding the mind as a substance. First, a substance is ontologically independent: it can exist without anything else.² Even if the body or world in which the mind resides suddenly disappears, the mind can exist without any change or difficulty. Second, the mind is *res cogitans*, a non-physical, thinking *thing*.

(2) Since the mind is a non-physical entity, locating it anywhere, let alone “in the head” might seem unintelligible. However there are two different aspects of space: extension and location.³ The latter is possible without extension or taking up room, e.g. points in Euclidean geometry. It is relatively safe to assume that Descartes locates the mind in the head, because he names the pituitary gland as the place of interaction between mind and body.

(3) Since the body is *res extensa*, an extended thing, and the mind is *res cogitans*, a thinking thing, the interaction between the two is conceptually impossible⁴: the properties of both constitute a fundamentally distinct ontological category, of which there is no joint element. The gap between these categories is so wide, that it becomes very hard to link them without using the notion of God.⁵

(4) The solipsistic starting point is where Descartes' epistemic journey for reliable knowledge begins. However, it also makes the ontological distinction between mind and world deeper and more vivid. In this picture the mind is so “far away” from the world, that intellectual genius is required and the proof that God exists in order to prove that the external world even exists.

Descartes' demon is present to this very day. It affects our everyday thinking, our philosophical and cognitive scientific theorizing as well. Even though there has been a significant shift towards a monistic ontology in both (mostly motivated by the conceptual impossibility of the interaction between two distinct substances), some aspects of the demon still resides. Let us see the points in which it is manifested.

(1) The mind is *not* a substance any more: it cannot exist without the brain and the nervous system. However, it is still a *thing*: a thing that is just like a computer in a sense that it generates behavioral outputs from the environmental inputs.

(2) The mind is still “in the head”. It is either (a) identical to the brain or (b) realized by the nervous system.

(3) Cognitive processes are processes of the brain and the nervous system: the non-neural body is only in a causal interaction with cognitive processes, it does not constitute them.

(4) Cognitive processes are processes of the brain and the nervous system: the external world is only in a causal interaction with cognitive processes, it does not constitute them.

¹ It might be unjust to put all the blame on Descartes, and (2) might not even be true, or at least some arguments would be needed to justify it. However it corresponds with most of the authors of the extended mind literature, therefore we are not going to address this problem here further. If someone finds it too inaccurate, they can think of this as a fictitious standpoint in which Descartes took some part by forming it.

² In a stricter sense only God is a substance in Descartes' thinking: He is the only entity that doesn't depend on anything else in its being. The other two substances are derived from God.

³ This is not clear in Descartes' thinking, these different aspect of space are never clearly distinguished.

⁴ Descartes' solution of the pituitary gland as the place of interaction is problematic to say the least.

⁵ This gap is still causing a lot of headaches to the philosophers of mind under the name of *mental causation*.

The hypothesis of classical cognitive science therefore is that cognition⁶ can be examined in isolation, in a “methodological solipsism” (Fodor, 1980): separated from bodily, physical, social and cultural contexts.

In the model of cognition formed by these assumptions, called the “classical sandwich model” (Hurley, 1998), the lower level processes such as perception and action are separated from higher level cognitive processes. Local processes are responsible for the cognitive phenomena, elements outside this system are only relevant in a way that they provide sensory input or they allow behavioral output. (Wilson & Foglia, 2016) Perception, cognition and action are causally linked, but they are constituted independently. It can be seen that this model perceives cognition as a fairly closed system.

However, there is something else that can be seen like this: „*during a sufficiently short time span an organism is approximately closed*, almost like a crystal.” (Popper, 1977:114) In the following I shall show that this approach is not only insufficient to view organisms, but it does not apply to cognition either. Examining the mind as a process and as an open system, might be much more appropriate.

The following experiments’ functions are twofold. On the one hand, they are supposed to prove that the Cartesian demon still influences us in our everyday thinking. By this I mean that the results of the experiments are *surprising*, because they contradict our Cartesian intuitions. On the other (more important) hand, these results do not easily fit in the traditional framework, and are hardly consistent with it.

Body and mind (embodied mind)

In an experiment, non-Chinese monolingual subjects had to rate Chinese ideographs by their attractiveness, while performing attitude-relevant motor behavior. They performed either positively or negatively valenced actions (pushing the table upwards from below or pushing the table downwards). The subjects rated those ideographs more positively during which they were performing positively valenced actions, than those ideographs during which they were performing negatively valenced actions or no action at all. (Cacioppo, Priester & Bernston, 1993) This gives us reason to believe that motor functions play a role in attitude formation.

In another experiment, subjects had to work with positively and negatively valenced words (such as love and hate). Their task was to indicate in which category the appearing word belongs by pulling a lever towards themselves or pushing it away. (Chen & Bargh, 1999) The reaction time of the subjects differed significantly in the different cases. It was quicker when the word and the action matched (e.g. pulling the lever towards yourself when seeing a positively valenced word or pushing it away in response to a negatively valenced word) than when the word and the action did not match.

Another experiment examined the effects of gestures on cognition. (Goldin-Meadow et al., 2001) There were two groups of children, whose task was to memorize a list of words, then complete a mathematical calculation, then recall the list of words. One of the groups was allowed to gesture freely, the other one was told not to. The no-gesture group reached robustly poorer results in remembering the words than those who could gesture freely.⁷ This leads us towards the conclusion that gestures somehow reduce or shift the cognitive load, therefore freeing up cognitive capacity for the memory task.

These results do not fit easily into the classical cognitive model, because there the higher cognitive processes (such as attitude-formation or memory) are separated from lower processes such as perception and action: the sensory-motor processes are only in causal relation with higher processes. However, these results seem to push us into the direction of grasping cognition, perception and action as being in a deeper, co-constitutive relation, where they depend on and constitute each other. (Robbins & Aydede, 2009: 4)

The world in mind (embedded mind)

Kirsh and Maglio (1994) examined people playing with the game *Tetris*. The aim of this game is to rotate falling two-dimensional shapes so that they fit into other forms below. The falling pieces are also falling at an increasing speed, so the player has less and less time to decide where to put the pieces. The experiment showed that expert players (who had proven to be better at the game) used the rotate-button to rotate the

⁶ Which of course differs greatly from Descartes’ concept of mind. In his case the cogito is something that is directly available, we can see it with our „mind’s eye”: it is conscious. Cognition however in its newer sense is not always conscious, many of its processes can never even be conscious.

⁷ The experimenters ruled out another obvious explanation, namely that it was not the case that gestures help distribute the cognitive load, but focusing on *not* to gesture adds extra cognitive load. They were able to do this because some of the subjects didn’t perform gestures, even though they were allowed to and their scores were also worse than those who performed gestures.

pieces *physically* instead of doing this operation *mentally*. A similar experiment studied subjects' ways of packing goods in bags while grocery-shopping. The skillful subjects, as the goods arrive on the conveyor-belt, categorize and arrange them accordingly in the working space, so later they can put them in the bags in a fashion that nothing gets damaged during transportation. (Kirsh, 1995)

The strategy is similar in both cases. Instead of doing all the work "in the head", we distribute the cognitive load (in this case the load of working memory) in the external world. To grasp this phenomenon, the authors use the notion of *epistemic action*. (Kirsh & Maglio, 1994)

An action is epistemic, when it alters "the world so as to aid and augment cognitive processes such as recognition and search" (Clark & Chalmers, 1998:28) It is distinguished from *pragmatic* actions which alter the world in a way that the physical alteration is itself desirable. (e.g. adjusting a table so it does not wobble.)

Epistemic actions are not exotic events that only happen in rare circumstances. Imagine the following task: we have to solve a jigsaw puzzle. There is only one (unjust) rule: that we must not rotate or arrange the pieces physically – all these operations must be done in our *heads*. With this restriction, instead of a fun game we would face a nightmarish challenge. Or consider the following task. We have to find something that is in one of many very similar boxes. How would we proceed? Wouldn't we mark the ones that we have already checked (e.g. writing an "x" on it) or arranging them in a way that their position in space imply whether they have been checked or not?

There is something common in these examples. While the brain performs some of the cognitive operations, it also "delegates" some of them to the external world, so the cognitive load is distributed. It is simply *easier* to solve the puzzle, if we can arrange the pieces, and it is also easier to focus on our search among the boxes if we don't have to constantly recollect which boxes had been checked already. It is a general human tendency: we lean heavily in our everyday lives on the external world in our cognitive endeavours. At times like these we let the world serve as its "own best model" (Brooks, 1991:140) or as an "outside memory". (O'Regan, 1992:461)

We constantly spare the cognitively costly internal representations of the world during perception as well by simply leaving them "out there" in the world. This can be demonstrated by the well-documented phenomenon called *change blindness*. (Simons & Levin, 1997) In experiments about this subjects are usually shown a short video where they cannot perceive even dramatic changes in the scene either because they focus on something else, or the scene goes black for a few seconds. This implies two important things. First, the sense that we have an accurate internal representation of our surroundings is an illusion. Second, storing and manipulating information in external situations is something that we almost always, constantly do.

World as mind (extended mind)

The previously mentioned studies and the concepts of mind they underline don't necessarily mean a sharp break from the classical model: this deep, often surprising relation between cognition, sensory-motor brain processes, non-neural body and external world can somehow still be explained by *causal* relations. There are others however, who think that a *constitutive* relation is needed in order to explain this deep interconnection.

The concept of the *extended mind* (Clark & Chalmers, 1998) takes the causal relation between epistemic actions and cognition and radicalizes it: they say that *epistemic actions* are *parts* of cognition, therefore they themselves *are* cognitive. As a slogan: "cognitive processes ain't (all) in the head." (Clark & Chalmers 1998: 29)

They present the following thought experiment. Otto is suffering from a mild form of Alzheimer's disease and often forgets useful information, therefore he is always carrying a notebook, in which he writes down every bit of information he considers useful. Otto hears that there is an interesting exhibition in MoMA and decides to go and see it. Since he doesn't remember the address of the museum, he consults his notebook: he can see that it is in 53rd street, therefore he goes there.

Inga, on the other hand, has a completely healthy brain. She is also interested in the exhibition and decides to go and see it. However, she uses her biological memory: she simply recollects where the museum is and goes there.

The authors think that the two cases are analogous: Otto and Inga both went to the 53rd street because they *believed* that the museum is there. Inga retracted the address from her biological memory, Otto retracted it from his notebook – but this is a superficial difference. They both have the dispositional belief about the whereabouts of the museum *even before* retracting it. What makes information a belief is how it functions: if it drives cognition and behavior as beliefs usually do, then there is no reason for us to think that it is not a belief only because it is located outside the head. Therefore mental states can – in some cases – supervene on things outside the head, ergo: the mind extends into the world.

Otto and his use of the notebook is only different from the aforementioned epistemic actions in that in this case he doesn't arrange things spatially so that this arrangement carries information for him: he *manipulates information-bearing symbols* - he writes in his notebook. This entry then affects his behavior – on a functional level there is no difference whether he retracts the information from his biological or external memory. Clark and Chalmers think that Otto and his notebook are *coupled* in a special way: the cognizing subject and the external element form a cognitive system in its own right.

This coupling has the following properties:

- (1) There is a two-way interaction between the (internal and external) elements.
- (2) All the components in the system play an active causal role.
- (3) The elements jointly govern behavior in the same sort of way that cognition usually does.
- (4) If we remove the external element the system's behavioral competence will drop, just as it would if we removed a part of its brain.

The concept of the extended mind or *active externalism* has been met by thinkers on a broad intellectual and emotional scale, and has been functioning as a starting point of one of the most intense debates in contemporary philosophy. There are several strategies available for critics to attack the concept⁸, but we will not address them here, nor will we consider the possible responses to these attacks, or deal with possible and promising extensions of the original extended mind thesis. (E.g. Tollefsen, 2009)

If the metaphor that the mind “leaks” into the world is even comprehensible, then in the previously mentioned cases this “leaking” also has a direction. The mind extends from the brain beyond the boundaries of the organism: Otto *augments* his cognitive apparatus when using the notebook. But this direction can also be reversed.

Another motivation behind the extended mind comes from dynamic systems theory. (Robbins & Aydede, 2009:8) One can use the tools of it to describe in a mathematically exact way how a cognitive system's states change in relation to each other over time – and since internal changes depend *just as much* on the changes of the external states, it becomes important to track causal processes that cross the boundaries of the organism back and forth. The effect of the Cartesian demon which tried to grasp mind as a *thing* is confronted here with this new concept that sees mind as a dynamic system, a *process* where the external surroundings play just as important a role as internal states.

Of mice and men – extended mind and culture

In an experiment two groups of mice were studied. The first group lived in an enriched environment: they lived in a large cage in a group of twelve. Even the playthings of the cage were changed daily. The other group was kept in an impoverished environment: they lived alone in standard laboratory cages. The most important result of the study was that the ones living in enriched environments had a *heavier* cerebral cortex. (Rosenzweig et al., 1972) Popper draws the following conclusion from this: “It appears that the brain grows through activity, through having to solve problems actively.” (Popper, 1977:112)

Mice are not famous for changing their environments robustly, unlike humans who always change and manipulate their environment in a physical and cultural sense as well. Humans create and form external elements that aid them in their cognitive endeavours, and these elements can be parts of their extended cognitive systems through *coupling*. In this two-way interaction with the environment internal and external elements affect and are affected by each other. Due to the phenomenon of *neuroplasticity* these processes are resulted in changes in the brain, which also mean changes in the mind. Therefore the mind forms its environment (in a physical and cultural sense as well), but this environment also forms the mind.

If a brain scientist who specialized in mouse brains and who was committed to the classical model of cognition found the aforementioned groups of mice, he could draw the conclusion that they were *anatomically* different, which is simply not true. This is why the classical, static model needs to be replaced with a more dynamic one.

There is a good example of how significantly culture can have an effect on the ones who created it (and actively take part in it). There is a seminomadic sea-people called the Moken, whose children can see twice as good underwater than their European counterparts. It is due to their ability to constrict their pupils,

⁸ One of the many arguments against the thesis is that it is not necessary to assume that a hybrid cognitive system's external element plays a constitutive role, a causal one would be sufficient. This and other objections however form the topic of another paper.

therefore adapting to underwater environments. This skill is completely absent in European children – so much that the changes of the pupils were thought to be controlled by an involuntary reflex. However, this can also be taught to European children, therefore this skill cannot be hereditary. (Gislén, 2003)

With this I would only like to point out that even though thinking about extended cognitive systems usually takes the external element to be a physical entity (e.g. Otto's notebook), it can also be non-physical, such as a meme, a practice or a behavioral pattern (e.g. spending a lot of time underwater). However, analyzing such hybrid cognitive systems containing non-physical entities is a topic for another paper.

Conclusion

In our line of thought the classical cognitive model proved to be insufficient because it had difficulties in explaining the results of the mentioned experiments. Therefore the motivation arose for a more sophisticated concept of mind that considers bodily and external processes as well. A potential candidate for this was the *extended mind* with its hybrid cognitive systems containing both internal and external elements. This picture of human cognition and how it works in practice and in its environment seems more complete. It is also possible to extend the hybrid systems of the extended mind in a way that they include non-physical entities, e.g. products of culture and mind – this provides a promising area for further research.

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